## CONTROL DATA®

MODEL 3290-D DISPLAY EQUIPMENT

- General Description
- Operation
- Programming



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HARDWARE REFERENCE MANUAL

# MODEL 3290-D DISPLAY EQUIPMENT HARDWARE REFERENCE MANUAL

#### SECTIONS IN THIS MANUAL:

Section I — General Description

Section II — Operation

Section III — Programming

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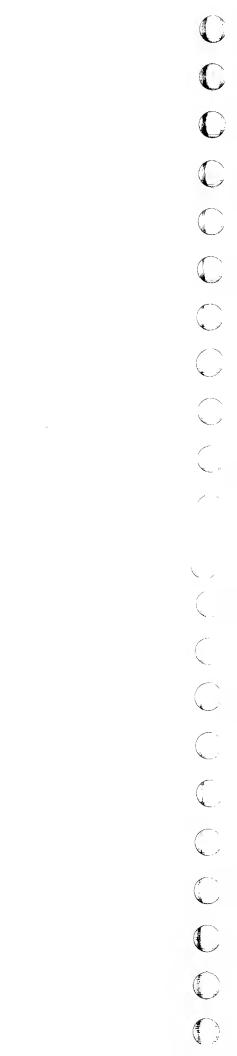
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## Model 3290-D Display Equipment HARDWARE REFERENCE MANUAL Revised Edition

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#### FOREWORD

This manual contains information to guide personnel in operating the CON-TROL DATA Model 3290-D Display Equipment. This manual explains the operation of the display equipment from a user's point of view and bridges the gap between the more detailed customer engineering publications for each device.

Discussion in this manual is arranged in three basic sections. A brief outline of each section follows:

Section I, General Description — contains functional, operational, physical descriptions, and electrical data.

Section II, Operation — lists controls and their functions and explains operating procedures through use of the controls.

Section III, Programming — gives programming aspects of the display equipment. Information is provided on function codes, status codes, interface signals, word formats, etc.

For a more detailed description of the equipment described herein, reference the Model 211-G, H, J, K, L, P Display Station Reference/Customer Engineering Manual (publication number 82117800), Model 218-F, G Printer Station Reference/Customer Engineering Manual (publication number 82132900), and Model 3290-D (with 215-B Poller and including Option 10033-C) Customer Engineering Manual, Books 1 through 4 (publication numbers 82123000, 82123100, 82135600, 82123200, and 82123300, respectively).

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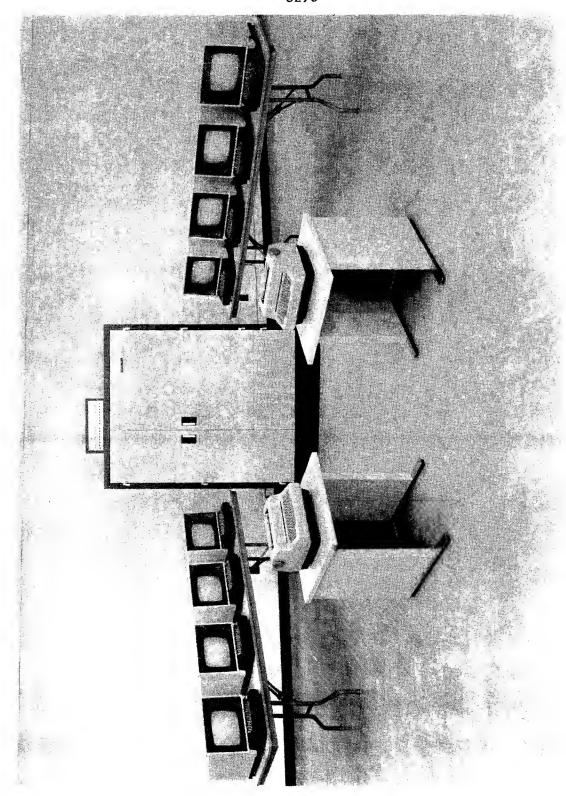


Figure 1–1. Typical Set of Display Equipment

#### SECTION I

#### GENERAL DESCRIPTION

The display equipment, designed for use with a CONTROL DATA 3000 Series computer, consists of a Display Controller and a combination (not to exceed 12) of Display Stations, Printer Stations, and pollers.

A typical set of display equipment is shown in figure 1-1. The display equipment provides access to data storage and computational capabilities of a central computer complex by means of inquiry and retrieval Display Stations. To obtain hardcopy records of displayed messages, transfer data to an associated off-line Printer Station. The poller allows communications between the computer and remote sites.

The Display Stations and/or Printer Stations may be located as far as 1000 feet from the Display Controller. A Display Station and its associated logic circuitry must be employed for every Printer Station used; however, one Printer Station may serve more than one Display Station. The poller assembly controls communications between the 3000 Series computer and a remote terminal Display Controller. Communications between the poller assembly and the remote Display Controller take place over conventional phone lines utilizing a DATA-PHONE\* Data Set 201A or 201B.

## OPERATIONAL DESCRIPTION.

Data is entered on the Display Station 14-inch (diagonal measurement) cathode ray tube (crt) screen from the computer at an approximate rate of 50,000 symbols per second and from the Display Station keyboard at operator typing speeds. Standard display format is 20 lines of 50 symbols per line within a nominal 8-inchwide by 6-inch-high raster area. An optional display format is available with 13 lines of 80 symbols per line.

Symbol intensity is adjustable and the P4 phosphor-coated crt makes displays clearly legible in normal office lighting. Data presented on the display screen is refreshed at a flicker-free rate of 50 cycles per second. Symbol dimensions are nominally 1/8-inch wide by 1/4-inch high.

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<sup>\*</sup> Trademark of AT&T

An entry marker, displayed as an underline, conveniently indicates to the operator where the next symbol will appear. The entry marker can be positioned anywhere within the 8 by 6 inch viewing area and moves automatically across the page as each symbol is typed, or inserted by the computer. At the end of a line, the entry marker automatically moves to the first symbol position in the next line down. When it reaches the end of the last line on the page, it automatically moves to the first symbol position in the upper left corner of the screen.

Positioning the entry marker at the end of the print message and depressing the keyboard PRINT key transmits displayed messages to an associated Printer Station. Data from the top of the screen to the entry marker position is transmitted to the Printer Station and typed out at the rate of 15.5 symbols per second on continuous strip paper 9-7/8 inches wide and perforated for folding and tearing at 11-inch intervals.

## FUNCTIONAL DESCRIPTION.

The remainder of Section I describes in more detail primary Display Controller, Display Station, and Printer Station functions.

The Display Controller consists of an interface, central control and symbol generator assembly, station driver assemblies, printer driver assemblies, and may contain up to two poller assemblies. On diagrams and some figures the central control and symbol generator assembly is referred to as CBU, station drivers as SDU's and printer drivers as PCU's.

The interface enables Display Controller communications with a 3000 Series computer. Two cables (up to 200 feet long), identified as "A" and "B", provide the data link between the computer and Display Controller. Twisted-pair signal lines, contained in cables A and B, are described under interface signals in Section III.

Symbol generation, timing, and data flow gating logic are contained in the central control and symbol generator assembly. Video pulse trains, representing symbols, are developed in the symbol generator. These pulse trains are made available to each station driver. The station driver selects the proper pulse train and transmits it to the crt where it is displayed by unblanking the beam in a 5 by 7 dot matrix. Symbol dimensions are, nominally, 1/8-inch wide by 1/4-inch high. Each station driver contains logic circuitry controlling the operation of a Display Station. It receives data from the Display Station keyboard and the central control symbol generator assembly. All data sent to the station driver is stored in an associated

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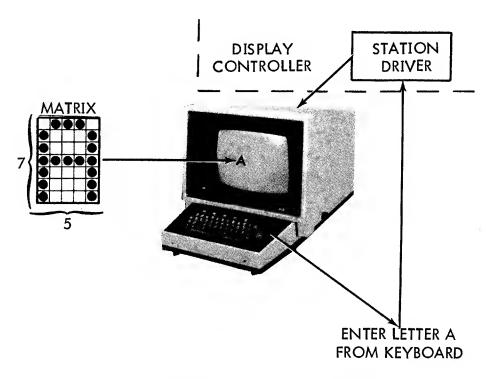


Figure 1-2. Display Station Functional Diagram

One symbol requires 16.8 microseconds to display while one line is displayed in 991.2 microseconds. Twenty lines of 50 symbols, therefore, require 19.824 milliseconds allowing 9 symbol times for horizontal retrace. Thirteen lines of 80 symbols require 19.437 milliseconds.

A printer driver contains the Printer Station control logic. Data from the station driver assembly register is translated and sent to the printer driver. Printer control and priority control logic are in the printer driver. One Printer Station can serve as an output device for up to 10 Display Stations if one poller is used or it can be used for an output device for up to 9 Display Stations if two pollers are used.

Each Printer Station contains a Selectric \* typewriter; depressing the PRINT key at a Display Station activates the typewriter. If the PRINT keys at several Display Stations associated with a Printer Station are depressed while the Printer Station is busy printing, the requests are processed in order of lowest Display Station number. Type set is designated "Data No. 1" \*\* and type spacing is 10 symbols per inch in a line with 6 lines per inch. The printer uses a black fabric ribbon to type symbols on a 9-7/8-inch-wide continuous strip paper. The paper is perforated for folding and tearing at 11-inch intervals. Feed holes are 9-3/8 inches apart and spaced 1/2 inch in the longitudinal direction.

Printout is accomplished at the following speeds: print one symbol, 64.5 milliseconds; carriage return, 129.0 milliseconds; shift, 64.5 milliseconds; and space, 64.5 milliseconds.

The Display Controller may contain a maximum of two pollers. Data is sent to or from the remote stations via the poller in 8-bit serial codes. The Data Set synchronizes all received or transmitted data. A poller controls the remote site's requests to transfer data by periodically polling (scanning) them in sequential order.

## ENVIRONMENTAL CONDITIONS.

The Display Controller operates at normal room temperature but has a blower assembly housing located beneath the logic chassis assemblies for specific cooling of the logic chassis. The Display Stations and Printer Stations also operate at normal room temperature but are cooled by radiation and convection. Tables 1–1 through 1–3 list specific environmental limitations for all three units.

## PHYSICAL DATA.

The display equipment configuration may consist of no more than 12 Display Stations, Printer Stations, and pollers. No more than two pollers may be employed, so the maximum display equipment configuration that would be possible locally would be a combination of ten Display Stations and/or Printer Stations with two pollers. The pollers are capable of communicating with up to 16 remote Display Controllers. Refer to figure 1–3.

<sup>\*</sup> IBM Trademark.

<sup>\*\*</sup> IBM Classification.

TABLE 1-1. DISPLAY CONTROLLER ENVIRONMENTAL CONDITIONS

CONDITION OPERATIONAL Normal/Standby		NONOPERATIONAL Storage/Transit (Note 1)
Temperature	+65 F to +85 F	- 30 F to + 150 F
Relative Humidity	10 to 90%	0 to 100% (Note 2)
Altitude	- 1000 to +10,000 feet	- 1000 to + 15,000 feet
Note 1 — packed for shipment.		
No	te 2 — includes condensation of moisture or frost.	in the form

TABLE 1-2. DISPLAY STATION ENVIRONMENTAL CONDITIONS

CONDITION	OPERATIONAL Normal/Standby	NONOPERATIONAL Storage/Transit (Note 1)
Temperature	+65 F to +100 F	-65 F to +160 F
Relative Humidity	40 to 60%	10 to 90% (Note 2)
Altitude	8,000 feet	12,000 feet
Note 1 — p	acked for shipment.	
1	ncludes condensation in r frost.	the form of moisture

TABLE 1-3. PRINTER STATION ENVIRONMENTAL CONDITIONS

CONDITION	OPERATIONAL Normal/Standby	NONOPERATIONAL Storage/Transit (Note 1)
Temperature	+60 F to +100 F	-30 F to +150 F
Relative Humidity	10 to 90%	5 to 100% (Note 2)
Altitude	- 1000 to +10,000 feet	- 1000 to +15,000 feet
No	ote 1 — packed for shipment.	
No	ote 2 — includes condensation in moisture or frost.	the form of

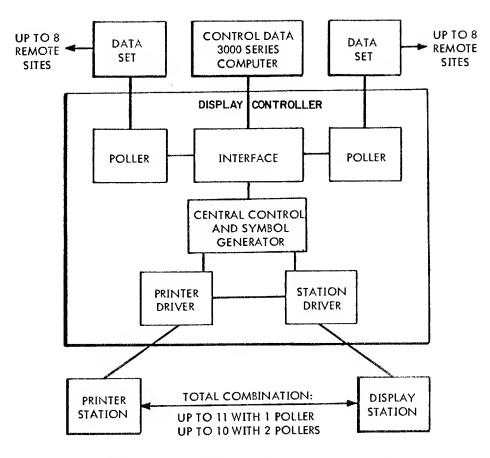


Figure 1-3. Display Equipment Block Diagram

Physical construction of the display equipment incorporates latest recognized factors in engineering, convenience, and safety to operating personnel. Figures 1-4 through 1-6 show the dimensions and approximate weight of the Display Controller, Display Station, and Printer Station respectively.

## DISPLAY CONTROLLER ELECTRICAL DATA.

The Display Controller requires 57 to 63 Hz, 187 to 216 volts, 3-phase alternating current of 8 amperes. Each station driver or printer driver requires 0.4 ampere in addition to that required for the Display Controller.

Section I 3290 General Description

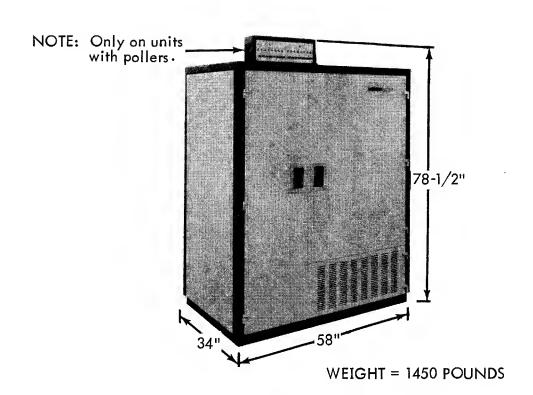


Figure 1-4. Display Controller Physical Data

## DISPLAY STATION ELECTRICAL DATA.

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The Display Station requires 115/230-volt, 50/60-Hz, 3-wire, single-phase power. Power expended is 130 watts with heat dissipation of 465 Btu per hour. Voltage potentials in the Display Station range from - 16 volts dc to 10 kilovolts.

## PRINTER STATION ELECTRICAL DATA.

The Printer Station requires 120-volt, single-phase, 60-Hz power. It has a maximum current rating of 1.0 ampere, dissipates 400 Btu per hour, and is cooled by radiation and convection.

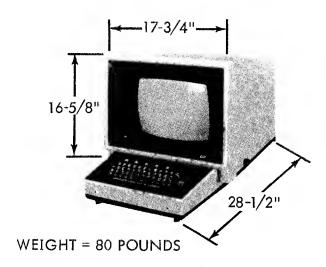


Figure 1-5. Display Station Physical Data

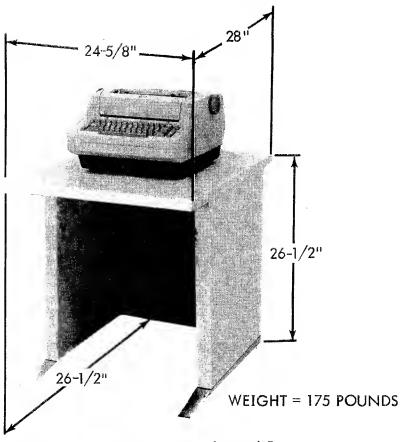


Figure 1-6. Printer Station Physical Data

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General Description

## CONVENIENCE OUTLETS.

To facilitate the use of test equipment during periods of maintenance, Control Data requires that a convenience outlet be available within 15 feet of each system component cabinet. The outlets may be located in the walls or raised floor panels and must not be obstructed by storage racks or other furniture. The receptacles shall be of the single-phase grounded type, installed according to local electrical codes. For 60-hertz installations, the nominal voltage shall be 120 volts. For 50-hertz installations, the nominal voltage shall be 220, 230, or 240 volts, as dictated by the single-phase power available at the site.

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#### SECTION II

#### **OPERATION**

This section contains a list of controls for operation and maintenance of the display equipment and also contains information on data inquiry, and turn on/turn off procedures.

## CONTROLS.

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Display Equipment controls are divided into three groups: Display Controller, Display Station, and Printer Station. Following paragraphs explain control usage within each group.

The Display Controller maintenance panel controls apply power and enable checking the display equipment operational sequence. Display Station controls apply power and adjust crt intensity. The Display Station keyboard enters data into the display equipment and controls its destination. Printer Station controls apply power to the hardcopy printer.

#### DISPLAY CONTROLLER.

Figure 2-1 shows the Display Controller maintenance panel. Table 2-1 explains the callouts.

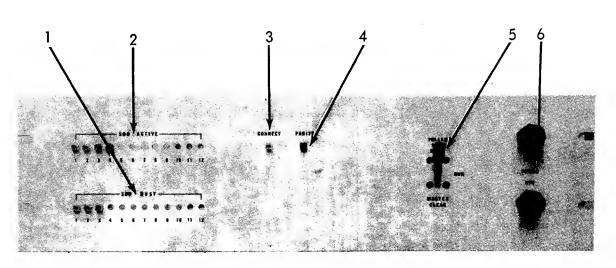


Figure 2-1. Display Controller Maintenance Panel

TABLE 2-1. MAINTENANCE PANEL CONTROLS AND INDICATORS

CALLOUT	CONTROL	CONTROL	FUNCTION
CALLOUT	NAME	TYPE	FUNCTION
7	SDU BUSY 1 through 12	Indicators white	Indicates the print busy status of each Display Station.
2	SDU ACTIVE 1 through 12	Indicators white	Indicates the input/output status of each Display Station.
3	CONNECT	Indicator white	Indicates the Display Controller is connected to the computer by a computer connect code.
4	PARITY	Indicator red	Indicates the Display Con- troller has detected a transmission parity error.
5	POLLER TEST/ RUN/MASTER CLEAR	Lever switch 3-position	POLLER TEST — allows communications between remote site and poller. RUN — enables normal Display Controller operation. MASTER CLEAR — clears Display Controller logic and all data from the delay-line memory within each station driver.
6	POWER ON/OFF	Two push— buttons	Turns Display Controller cabinet power on and off.

The auxiliary maintenance panel (figure 2-2) contains a toggle switch and a light for each of the sixteen possible remote sites (8 for each poller). The corresponding site address for each switch is labeled directly below the switch. If a switch is in the down position, the corresponding remote site receives a poll message from the poller. If it is in the up position, its site address is not polled in the poller sequence.

The indicator for each site, located directly above the switch, illuminates when a poll message is initiated to its corresponding remote site. The indicator extinguishes when the poller receives an errorless message from that site. If a particular indicator remains illuminated indefinitely, there is a communications

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problem between that site and the poller. The switch corresponding to this indicator should then be placed in the up position. This will extinguish the light and remove the site from the system.

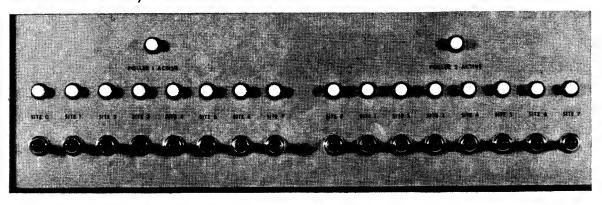


Figure 2-2. Auxiliary Maintenance Panel

Circuit breaker CB1 on the a-c control panel (figure 2-3) applies primary 208-volt, 3-phase power to the Display Controller. Also on this panel are two 120-volt ac convenience outlets and a meter, M1, which indicates the total number of hours power has been applied to the Display Controller. The six fuses located on the panel provide circuit protection for the power supplies, blower assembly, and convenience outlets.

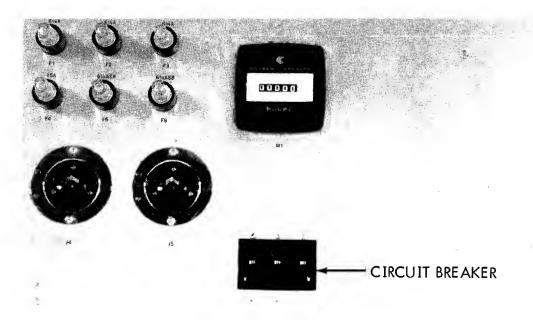


Figure 2-3, A-C Control Panel

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The interface panel contains the EQUIPMENT SELECTOR rotary switch (figure 2-4) for selecting a specific external equipment address 0 through 7 for the Display Controller. The switch setting also determines which interrupt line to the computer is used. Four receptacles are provided for connecting the Display Controller to the computer; only two are used at one time. The other two should be terminated if not in use.

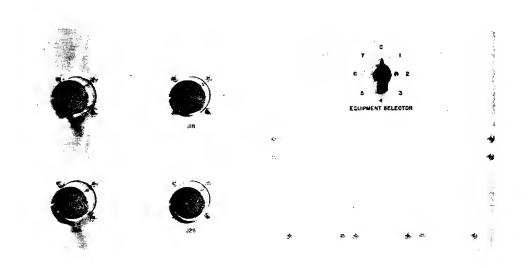


Figure 2-4. Display Controller Interface Panel

Figure 2-5 shows the Data Set interface panel. This panel provides the power and data outlets for two pollers. J1 and J2 are the data cable receptables while J3 and J4 provide 120-volt ac, 60 Hz power to the Data Set.

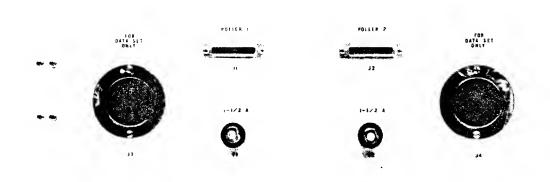


Figure 2-5. Data Set Interface Panel

#### DISPLAY STATION.

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Rotating the ON/OFF/INTENSITY control, located on the right side of the Display Station, toward the rear of the cabinet turns the Display Station on; further rotation increases the intensity of the displayed symbols. The ON/OFF/INTENSITY control being off does not prevent communication on the interface between the computer and the delay-line memory and does not disable keys on the keyboard, except the SHIFT key. Figure 2-6 shows the Display Station and figure 2-7 shows the Display Station keyboard.

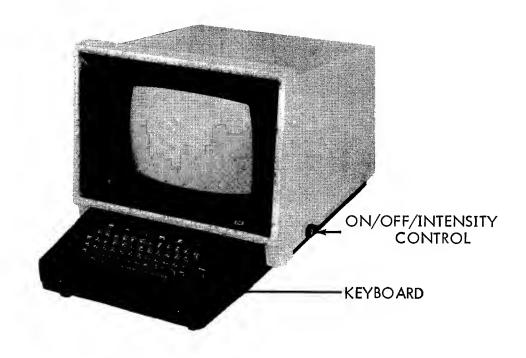


Figure 2-6. Display Station

Four rows of keys on the Display Station keyboard enter symbols into the delay line for display on the crt. Depression of a key enters the code for the symbol indicated on the key into memory at the position of the entry marker, generates the symbol on the crt, and advances the entry marker. The keyboard is inoperative during the following intervals:

- (a) SEND key is depressed until the end of a read message from or a write message to that station.
- (b) PRINT key depressed until printout is complete. The CLEAR key is not locked out during printout.



Figure 2-7. Display Station Keyboard

- (c) The station is connected and the Channel Busy signal is a logical 1.
- (d) Reset function or reset clear function is being performed by the Display Station.

The following list explains the operation of the control keys.

## Clear.

Depress the CLEAR key to clear all data from the delay line and from the crt. The entry marker moves to the upper left corner of the screen. This operation prevents sending or receiving data from the time the key is depressed until 16.8 microseconds to 20 milliseconds after the key is released. (The time variation is due to latency characteristics of the delay line).

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## Reset.

Depress the RESET key to move the entry marker to the upper left corner without affecting data. This operation prevents sending or receiving data from the time the key is depressed until 16.8 microseconds to 20 milliseconds after the key is released.

## Shift.

Continued depression of either SHIFT key enables entry of the upper symbol on the two-symbol keys. Operation of the single-symbol keys is not affected by the SHIFT keys; all alphabetic symbols are displayed in uppercase form. The SHIFT keys are nonlocking.

## Space.

Operating the SPACE key stores a space code in the delay line at the position of the entry marker and advances the entry marker. Data is not affected.

## Skip.

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Depress the SKIP key to move the entry marker one space forward. Data is unchanged.

## Repeat.

Operating the REPT key in conjunction with another key enables a repeated action of that key's character/function. CLEAR, PRINT, RESET, SEND, and SHIFT keys are not affected by the REPT key.

## Backspace.

The BKSP key moves the entry marker one space back without changing data. Backspace is accomplished in 10 milliseconds minimum to 90 milliseconds maximum, during which time no data can be transferred on the data channel.

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Operation

## Line Skip.

Depress the LINE SKIP key to advance the entry marker to the beginning of the next line. Line skip is accomplished in 151.2 microseconds minimum to 1 millisecond maximum, during which time no data is transferred between a connected Display Station and the computer.

#### Return.

Operation of the RETURN key inserts a carriage return code at the entry marker position and moves the entry marker to the first symbol position on the next line. The carriage return is displayed as a superscript dash (). The return takes from 151.2 microseconds (if the entry marker is at the end of a line) to 1 millisecond (if the entry marker is at the beginning of a line), during which time no data can be transferred between the Display Station and the computer.

## Send.

The SEND key stores an end of message symbol (elevated  $^{\Delta}$ ) at the entry marker position and moves the entry marker to the upper left corner. Data transfer is prevented during the time (16.8 microseconds minimum to 20 milliseconds maximum) the entry marker is moving.

## Print.

Operation of the PRINT key stores an end of print code (') at the entry marker position, moves the entry marker to the upper left corner, and initiates printout of data from the upper left corner to the end of print code on an associated Printer Station. The keyboard, except for the CLEAR key, is disabled during printout. During printout, the Display Station is not ready to the computer.

#### PRINTER STATION.

Figure 2-8 shows the Printer Station typewriter controls. Note the location of the ON/OFF switch to the right of the keyboard. A multipaper adjustment (top left) provides even printing for carbon copies. Remaining controls are common

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to an electric typewriter and include the following: platen knobs for manually advancing the paper, a line space lever for single or double spacing, a paper release lever, left and right visible margin stops, an impression selector lever which adjusts the striking force of the typing element, a tab set and clear control, tab key, index key, shift keys, margin release, space bar, etc.

Refer to the IBM Selectric Manual supplied with the equipment for more detailed information about the typewriter.

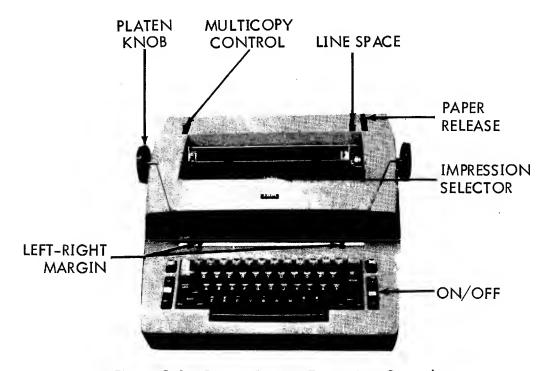


Figure 2-8. Printer Station Typewriter Controls

## OPERATING PROCEDURES.

The remainder of this section describes normal operating procedures for the display equipment. Included are turn on/turn off procedures followed by a typical operation sequence.

## TURN ON/TURN OFF.

Turn on/turn off procedures are listed in table 2-2. For precautionary measures, it is recommended the steps be followed in the order listed.

TABLE 2-2. TURN ON/TURN OFF PROCEDURES

	TABLE 2 2: TORIT OTT TROCEDORES		
STEP	LOCATION	OPERATION	
	TURN ON		
1	Display Controller	Place the POWER ON/OFF switch in the ON position. Move RUN/MASTER CLEAR switch to MASTER CLEAR position, then to RUN position.	
2	Display Stations	Rotate the ON/OFF/INTENSITY control to the ON position. Depress the CLEAR key. After a 30-second warmup period, rotate ON/OFF/INTENSITY control until the entry marker is visible.	
3	Printer Stations	Depress the ON/OFF rocker switch to the ON position.	
		TURN OFF	
1	Printer Stations	Depress the ON/OFF rocker switch to the OFF position.	
2	Display Stations	Rotate the ON/OFF/INTENSITY control to the OFF position.	
3	Display Controller	Place the POWER ON/OFF switch in the OFF position.	

#### TYPICAL OPERATION SEQUENCE.

Figure 2-9 is a flow diagram depicting a typical operation sequence. Depress the CLEAR key on the Display Station keyboard to clear the display screen. The operator then enters data via data entry keys. When data is properly composed, it may be sent to the computer by actuation of the SEND key, or to a Printer Station, which shares memory with the Display Station, by depressing the PRINT key.

The computer may respond to properly transmitted data by sending the requested data or a message acknowledging receipt of the transmitted data. The operator may then print the reply data, or edit it (eg, filling in information on a blank form, or updating stored data), and transmit the edited data back to the computer.

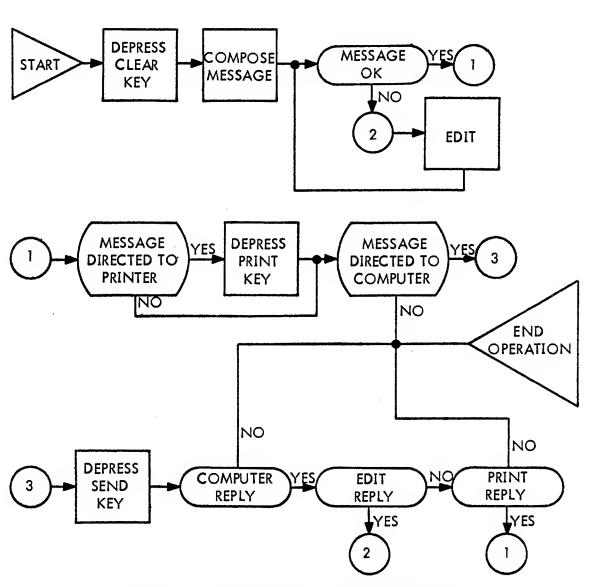
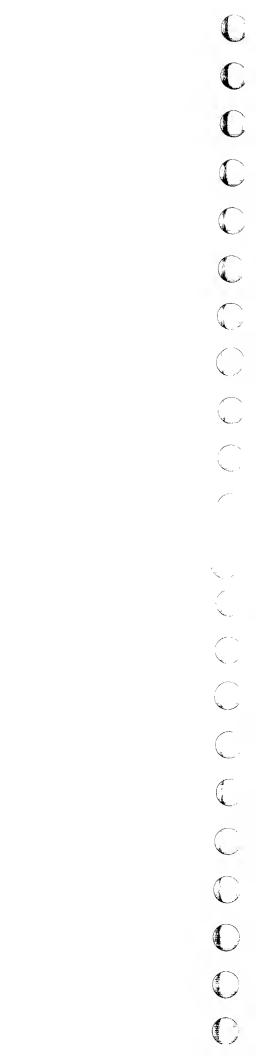


Figure 2-9. Typical Operation Sequence Flow Diagram

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#### SECTION III

#### PROGRAMMING

This section describes programming aspects of the display equipment. It provides a complete description of signals, function and status codes, interrupts, symbol data, word formats, various read/write operations, and programming aids for both interface and poller assemblies.

### INTERFACE SIGNAL LINES.

The Display Controller operates from the standard (12 bit) 3000 Series standard communications channels. Figure 3-1 shows the interconnecting data and control lines between the computer communications channel and the Display Controller. Following is a description of each line or group of lines.

#### DATA LINES (12).

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There are 12 bidirectional data lines. During a read operation (input to the computer), these data lines carry data, 12 bits at a time, from the Display Controller to the computer. During a write operation (output from the computer), the data lines carry data from the computer to the Display Controller. The data lines also are used to transmit the 12-bit connect and function codes associated with Connect and Function signals, respectively.

#### PARITY LINE.

A parity bit accompanies each 12 bits of data, connect code, and function code transmitted between the computer and the Display Controller. Odd parity is used, ie, the total number of 1's transmitted is always an odd number.

#### CONNECT LINE.

A Connect signal is sent to the Display Controller when a 12-bit connect code is available on the data lines. The Display Controller connects only if the following conditions are met:

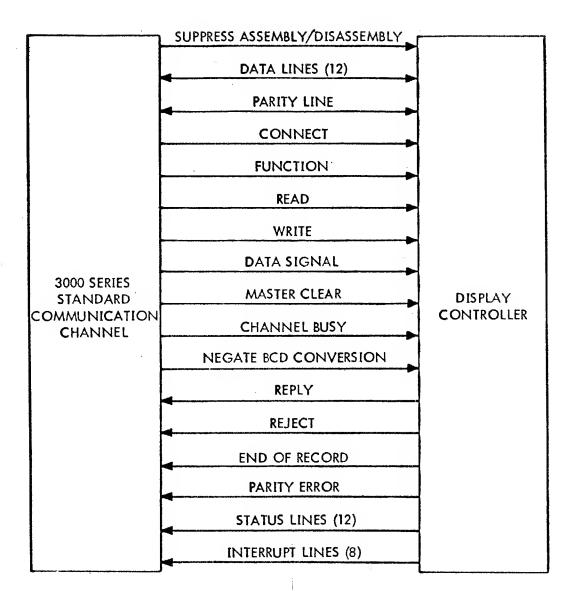


Figure 3-1. Computer/Display Controller Interface Lines

- (a) The most significant 3 bits of the connect code must match the number setting of the EQUIPMENT SELECTOR switch.
- (b) Display Controller power is on.
- (c) The RUN/MASTER CLEAR switch is in the RUN position.
- (d) Parity is correct.

No response is returned when a parity error exists on the connect code; however, the red PARITY error indicator on the Display Controller maintenance panel (figure 2-1) lights on all Display Controllers and external equipment controllers associated with that communications channel. After a delay of 100 microseconds, the communications channel generates its own internal Reject signal.

Once a Display Controller is connected to the computer, it remains connected until the communications channel initiates a disconnect. To perform a disconnect, send any connect code with the upper 3 bits not matching the Display Controller EQUIPMENT SELECTOR switch setting, a Master Clear signal, or a release function code.

#### FUNCTION LINE.

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A Function signal is sent to the Display Controller when a 12-bit function code is available on the data lines (function codes are listed under interface control codes). If the Display Controller is connected to the computer and is capable of executing the specified function at the time it receives the Function signal, it initiates the function and returns a Reply signal. If the Display Controller cannot perform the function, it returns a Reject signal. The Function signal and 12-bit function code drop when a Reply or Reject signal is returned. If a Reply or Reject signal is not returned within 100 microseconds, the computer generates its own internal reject.

The specified function is not performed if a parity error exists on the function code; however, a Parity Error signal is returned by the Display Controller and the red PARITY error indicator on the Display Controller maintenance panel (figure 2-1) lights.

Once a function code is accepted by the Display Controller, all other function codes are locked out until the first one is acted upon. The Display Controller does not hold or stack up the function codes; a Reply or Reject signal is returned within 5 microseconds. If a second function code is received which specifies the same function as the previous function code, the second function code is rejected unless the function can be performed immediately a second time.

#### READ LINE.

A Read signal transmitted to the Display Controller directs the Display Controller to begin reading data from a specified Display Station memory.

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#### WRITE LINE.

A Write signal transmitted to the Display Controller directs the Display Controller to begin writing data into a specified Display Station memory.

#### DATA SIGNAL LINE.

A Data signal is sent from the computer to the Display Controller for each 12-bit data word during read and write operations. The Data signal drops when a Reply (or End of Record) signal is transmitted by the Display Controller.

During a read operation, the Data signal indicates that the computer is ready to accept a 12-bit data word from the Display Controller. During a write operation, the Data signal indicates that the computer placed a 12-bit data word on the data lines.

#### MASTER CLEAR LINE.

A Master Clear signal sent from the computer returns the Display Controller to its initial clear condition and starts the polling operation.

#### CHANNEL BUSY LINE.

A Channel Busy signal is sent to the Display Controller when the computer communications channel is active during a read or write operation.

#### NEGATE BCD CONVERSION LINE.

When the Negate BCD Conversion signal is a logical 1, external BCD codes are used; when the Negate BCD Conversion signal is a logical 0, internal BCD codes are used. Refer to Symbol Data in this section.

#### REPLY LINE.

The Display Controller transmits a Reply signal in response to the following:

- (a) A connect code having no parity error and containing a matching Display Controller EQUIPMENT SELECTOR switch equipment select code and proper select code.
- (b) A function code received with no parity error if the Display Controller is capable of executing the specified function at the time it receives the Function signal.
- (c) During a write operation after the Display Controller has read a data word.
- (d) During a read operation when the Display Controller has a word on the data lines (see End of Record signal for exception).

The Reply signal drops when the Connect, Function, or Data signal drops.

#### REJECT LINE.

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The Display Controller transmits a Reject signal in response to the following:

- (a) A connect code (with no parity error) specifying a nonexistent or busy station.
- (b) A function code (with no parity error) specifying an illegal function.
- (c) A function code (with no parity error) which cannot be performed within 5 microseconds after receipt of the Function signal (refer to programming aids for such conditions).
- (d) An alert function to a poller that had its alert request status cleared, or an alert function to any station other than a poller.

# SUPPRESS ASSEMBLY/DISASSEMBLY LINE.

During a read operation, the Suppress Assembly/Disassembly signal forces the Display Controller to assemble logical 0's in bits 6 through 11 of each 12-bit data byte. In a write operation, bits 6 through 11 are not used when the Suppress Assembly/Disassembly line is enabled. The signal has no effect on the address word during a read operation initiated by an interrupt.

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#### END OF RECORD LINE.

The Display Controller transmits an End of Record signal (instead of a Reply signal) in response to the next Data signal following transmission of EOM signal. The End of Record signal drops when the Data signal drops. If the Read signal drops before the read operation completes, the End of Record signal is not transmitted because the remaining data is not transmitted.

#### PARITY ERROR LINE.

The Display Controller transmits a Parity Error signal when a parity error occurs on a function code or write operation. No Parity Error signal is generated for a parity error occurring on a connect code or read operation. During a write operation, a parity error on one word of a 12-bit byte results in display of both words as parity error symbols when the Suppress signal equals 0.

# STATUS LINES (12).

The Display Controller places information on the 12 available status lines following a connect operation to indicate its operating conditions to the computer. Display equipment status remains enabled to the computer until a disconnect is sent from the computer. The computer may sample the status lines at any time. Status bits are listed under interface control codes.

#### INTERRUPT LINES (8).

Each Display Controller and external equipment controller attached to a given computer communications channel is assigned to one of eight separate interrupt lines selected by the EQUIPMENT SELECTOR switch. The interrupt line indicates to the computer that a predetermined condition has been reached. The interrupting condition can be determined by program sampling the status lines following transmission of an Interrupt signal if connected.

#### INTERFACE CONTROL CODES.

Interface control codes include connect, function, and status codes. The connect code is used in addressing the display equipment. Function codes, with

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the exception of reset, alert, and release, set up and remove interrupt conditions in the Display Controller. Status codes indicate what conditions exist at the Display Controller. Following is a description of the connect code, display equipment function codes, and status line assignments.

#### CONNECT CODE.

The connect code is 12 bits long and is transmitted to the Display Controller on the 12 data lines along with a Connect signal on the connect line. The Display Controller interprets the connect code (figure 3-2) as follows:

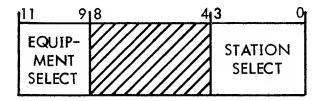


Figure 3-2. Connect Code

Bits 9 through 11 designate the number setting of the Display Controller EQUIPMENT SELECTOR switch. The station select portion of the connect code allows selection of a Display Station or poller or selection of a Display Station or poller that caused an interrupt. Bits 4 through 8 are not interpreted.

## FUNCTION CODES.

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Function codes are 12 bits long and are transmitted to the Display Controller on the data lines along with a Function signal on the function line. Table 3-1 lists and describes Display Controller function codes.

#### STATUS CODES.

Twelve status lines are available for indicating display equipment operating conditions to the computer. The computer may sample these lines at any time.

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TABLE 3-1. DISPLAY CONTROLLER FUNCTION CODES

	TABLE 3-1. DISPLATE	ONTROLLER FUNCTION CODES
OCTAL CODE	FUNCTION	DESCRIPTION
0000	Release	Disconnects the Display Controller from the computer and clears all interrupt selections and parity error indications. Also master clears a poller if the poller is connected.
0010	Reset Entry Marker	Positions the entry marker on selected Display Station or poller to upper left corner to prepare for a read or write. The Display Station or poller indicates busy status for 3.2 microseconds to 20 milliseconds after receipt of the function. Generally precedes a write or computer-initiated read.
0011	Reset–Clear	Similar to a reset entry marker function except data is cleared from the delay line. When addressed to a poller, the function does not clear the delay line but clears existing send requests. The Display Station or poller indicates busy status for 20 to 40 milliseconds upon receipt. Generally precedes a write to local station.
0020	Select Interrupt for Ready and Not Busy (Note 1)	Allows generation of an interrupt when printer operation completes. Reselection removes an interrupt resulting from a previous selection.
0021	Clear Interrupt Enable for Ready and Not Busy (Note 1)	Removes interrupt and selection resulting from code 0020.
0022	Select Interrupt on End of Operation (Note 1)	Allows generation of an interrupt when the read or write operations or a reset or a reset clear operation completes. Reselection removes interrupt resulting from a previous operation.

TABLE 3-1. DISPLAY CONTROLLER FUNCTION CODES (CONT)

	ADEL O II DISTERT COTT	ROLLER TOTACTION CODES (COINT)						
OCTAL CODE	FUNCTION	DESCRIPTION						
0023	Clear Interrupt on End of Operation (Note 1)	Removes interrupt and selection result- ing from code 0022.						
0024	Select Alert Interrupt	Allows generation of an interrupt upon completion of an alert message by a poller. Reselection removes an interrupt resulting from a previous operation.						
0025	Clear Alert Interrupt	Clears interrupt and selection due to code 0024.						
0026	Select Station Interrupt (Note 1)	Allows generation of an interrupt if a SEND key on a Display Station is depressed, if a poller receives a read message in response to a poll message or if an error is indicated. Reselection removes an interrupt resulting from a previous selection if a read or write operation is performed on the interrupting station prior to reselection. Stacking of station interrupts is possible and, if more than one station has had its SEND key depressed, another interrupt occurs immediately after reselection.						
0027	Clear Station Interrupt (Note 1)	Removes interrupt and selection result- ing from code 0026.						
(Note 2)	Alert Poller	Instructs connected poller to send an alert message to the addressed remote site and station. Alert occurs in the polling sequence. If the alert is sent to a local station, it is rejected.						
	Note 1 — affect o	all stations simultaneously.						

Note 2 — 1XXXXXXXX0011 binary.

Table 3-2 identifies status conditions, lines, and octal codes characteristic of the Display Controller. The computer may sample any single status line or group of lines.

All conditions listed in table 3-2 except send request and print request, are general status conditions; ie, the computer connects only to the Display Controller and any existing station before sampling status. Lines 0, 2, 3, 4, 5, and 10 are on a per station basis, ie, a specific station must be referred to before sampling status. Lines not listed in table 3-2 are not used.

TABLE 3-2. DISPLAY CONTROLLER STATUS CONDITIONS

LINE	OCTAL CODE	CONDITION	DESCRIPTION
0	XXXI	Ready	The Display Controller is ready when power is on and the RUN/MASTER CLEAR switch is in the RUN position. A particular station may become not ready if an operator depresses the PRINT key and the printer begins printout.
1	XXX2	Busy	The Display Controller is busy when the Channel Busy and the Read signal or Write signal is active, or when the reset or reset-clear function is executed. The Display Station keys are inoperative during a read or write operation.
2	XXX4	Send Request	Indicates on a per station basis that an operator depressed the SEND key or that a connected poller has a read message or a message in error.
3	XXIX	Print Request	Indicates on a per station basis that a print operation is requested by the station or it is performing a print operation.
4	XX2X	Poll Message Error	Indicates that the connected poller was unable to receive an expected response to a poll message in three attempts.

LINE	OCTAL CODE	CONDITION	DESCRIPTION
5	XX4X	Alert Request	A connected poller is ready to process an alert function from the computer. Any previous alert function has been processed.
6	XIXX	Station Interrupt	Indicates that a station interrupt was caused by depressing one or more SEND keys, or that a poller detected a message in error or received a read message.
7	X2XX	Ready and Not Busy Interrupt	Indicates that a ready and not busy interrupt was generated when print-out completed and that the ready and not busy interrupt was selected.
8	X4XX	End of Operation Interrupt	Indicates that an interrupt was generated by the end of a read/write operation, reset, or reset-clear function. A new function, or read or write operation may be initiated following the end of operation interrupt.
9	1XXX	Alert Interrupt	Interrupt generated by completion of an Alert message to a remote site.
10	2XXX	Poller Error	Error condition after three attempted write, clear-write, write-reset, or alert messages to a remote site from the connected poller.

## INTERRUPTS.

The interrupt permits the display equipment to indicate to the computer certain preprogrammed conditions. The computer can selectively activate or deactivate these interrupt conditions.

Four conditions generate an interrupt and four function codes enable these interrupts to the computer for the Display Controller. Table 3-3 lists the interrupt conditions, enabling functions, and disabling functions. Refer to the specific enabling function code (table 3-2) for a complete description of the interrupt condition.

TABLE 3-3. DISPLAY CONTROLLER INTERRUPTS

TA ITE DOLLOT	FUNCTION CODE			
INTERRUPT	ENABLE	DISABLE		
Ready and Not Busy	0020	0021		
End of Operation	0022	0023		
Alert	0024	0025		
Station	0026	0027		

The computer must first connect to a specific Display Station before issuing any interrupt enable function codes. Normally, status is checked immediately following the connect. If the computer desires to perform a reset operation (function code 0010), or a read or write operation, and wants to be informed when the operation is completed, it transmits function code 0022 (interrupt on end of operation) prior to the operation.

An end of printout operation can interrupt the computer if the ready and not busy interrupt is enabled. After connecting to a specific Display Station and finding the station busy executing a printout, the computer has the option to discontinue the printout or select the interrupt on ready and not busy condition (function code 0020). Even though the function code is directed to a specific Display Station, it enables a station interrupt from any Display Station satisfying the ready and not busy condition.

If the computer wants to receive the data from a local Display Station, function code 0026 (station interrupt enable) is transmitted. An interrupt transmits when the SEND key on this station, or any other Display Station, is depressed.

Upon receiving an interrupt from the display equipment, the computer normally connects to the Display Controller and samples status to determine what caused the interrupt. It can immediately perform a read operation following a connect word having a select code 0000 if the interrupt is a station interrupt. A write operation or other interrupt requires connecting to a specific station before beginning the operation. After servicing an interrupt, the interrupt line may be cleared by reselecting or deselecting the same interrupt except station interrupt.

# SYMBOL DATA.

The display equipment symbol repertoire includes the alphabet in uppercase, arabic numerals (0 through 9), punctuation marks, and special symbols.

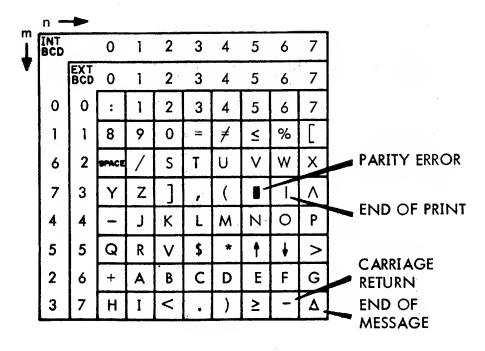
Table 3-4 presents the Display Controller symbol repertoire in alphabetic and numeric order. Figure 3-3 shows two quick reference charts for locating a

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TABLE 3-4. SYMBOL REPERTOIRE

	ВС	n			ВС	D.		ВС	D
SYMBOL	EXT	INT	SYMBOL		EXT	INT	SYMBOL	EXT	INT
Α	61	21		Х	27	67	Çomma ,	33	73
В	62	22		Υ	30	70	Left paren (	34	74
С	63	23		z	31	71	Parity error	35	75
D	64	24	Colon	:	00	12	End of	36	76
E	65	25		1	01	01	print (Note)	07	-7-7
F	66	26		2	02	02	Logical OR ^	37	77
G	67	27		3	03	03	Hyphen -	40	40
Н	70.	30		4	04	04	Logical AND	52	52
I	71	31		5	05	05	Dollar sign \$	53	53
J	41	41		6	06	06	Asterisk *	54	54
K	42	42		7	07	07	Arrow up	55	55
L	43	43		8	10	10	Arrow down	56	56
М	44	44		9	11	11	Greater than >	57	57
Ν	45	45		Ø	12	00	Plus +	60	20
0	46	46	Equal	=	13	13	Less than <	72	32
P	47	47	Not equal	≠	14	14	Period .	73	33
Q	50	50	Less than or	≤	15	15	Right paren )	74	34
R	51	51	equal to	%	16	16	Greater than ≥	75	35
S	22	62	Percent	Г	17	17	or equal to		
Т	23	63	Left bracket	L	20	60	Carriage return (Note)	76	36
U	24	64	1	ace	ļ	61	End of $\Delta$	77	37
٧.	25	65	Right diagonal	' / "	21		message	′′	"
W	26	66	Right bracket		32	12			
Note — displayed as superscript does not print.									

Note — displayed as superscript, does not print.



#### NOTE:

00 internal BCD equals 12 external BCD 00 external BCD equals 12 internal BCD

Figure 3-3. Symbol Code Quick Reference Chart

symbol when given the 6-bit octal or BCD code. A two-digit code of the form m/n uniquely specifies each code, eg, external BCD code 65 represents the letter E.

Standard display format is 20 lines of 50 symbols per line with an optional display format of 13 lines of 80 symbols available. The Display Station INTENSITY/ON/OFF switch adjusts symbol intensity. Symbol size is adjustable internally and is normally set to generate symbols 1/8-inch wide by 1/4-inch high.

# WORD FORMATS.

The display word format is 6 bits. Each 6-bit word specifies a symbol code or control code as listed in the symbol repertoire table.

Besides the display word format, there are five 12-bit interface word formats. The connect, function, data, and station word are transmitted on the data lines and are identified by a signal transmitted on a corresponding signal line. The status word is enabled to the computer on the status lines whenever the Display Controller is connected to the computer.

Table 3-5 lists all word formats and identifies the distinguishing signal where applicable.

TABLE 3-5. WORD FORMATS

WORD	FORMAT	SIGNAL
Display	6 CODE	
Connect	EQUIP- MENT SELECT	Connect
Function	FUNCTION CODE	Function
Data	SYMBOL 1 SYMBOL	Data
Status	STATUS CODE	
Station	REMOTE REMOTE REQUESTING STATION CODE CODE CODE	Data
Alert Function	1 110 817 413 0 1 REMOTE REMOTE 0011	Function

The connect word contains information which directs the Display Controller to connect the computer data channel to the designated Display Station or poller. Bits 9 through 11, the equipment select code, designates the equipment number which may be chosen on the EQUIPMENT SELECTOR switch. Bits 0 through 3 (the station select code) are used to select the specific local Display Station or poller with which the computer is to communicate. A station select code of 0001 through 1100 binary designates the corresponding numbered Display Station or poller. A station select code of 0000 binary indicates that the computer requests a check of status conditions, or requests to communicate with the lowest numbered Display Station causing an interrupt. If no interrupt is present, connection is prevented.

Figure 3-4 shows the sequence of events upon receipt of a Connect signal. If the Display Controller is in a ready state, parity is checked upon receipt of the Connect signal. A parity error at this time illuminates the PARITY indicator and the display equipment disconnects in approximately I microsecond. Assuming parity is correct, the EQUIPMENT SELECTOR switch setting is compared to the equipment select code. If the two do not compare, a disconnect is performed in about I microsecond. An exact comparison allows the status lines to be enabled. After comparing the equipment select code, the Display Controller examines the station select code to see if it is addressing an existing Display Station or poller. If the device is non-existent or busy, a Reject signal is transmitted to the computer no sooner than 2 microseconds after the condition is detected. Assuming the Display Station or poller exists and is not busy, the Display Controller responds with a Reply signal in about 2 microseconds.

If the station select code contains all 0's and an interrupt condition is not pending, a Reject signal is sent to the computer. An interrupt condition at this time draws a Reply signal response from the Display Controller and the interrupting Display Station or poller is connected. The computer then reads at least one word (the station word) and normally continues the read operation until all of that station's data is read. If the interrupt condition is nonexistent, a connect is made to the Display Controller for reading Display Controller status only. No read or write operation is performed.

Once connected, the Display Controller is ready to perform any function desired by the computer in addition to a read or write operation. Figure 3-5 shows the sequence of events upon receipt of a Function signal. If the Display Controller is not connected, it takes no action in response to a Function signal.

An assembly/disassembly register in the Display Controller handles packing and unpacking chores for read and write operations respectively. The most significant 6 bits of the data word are always filled or emptied first. If the computer enables the Suppress Assembly/Disassembly line, the most significant 6 bits would

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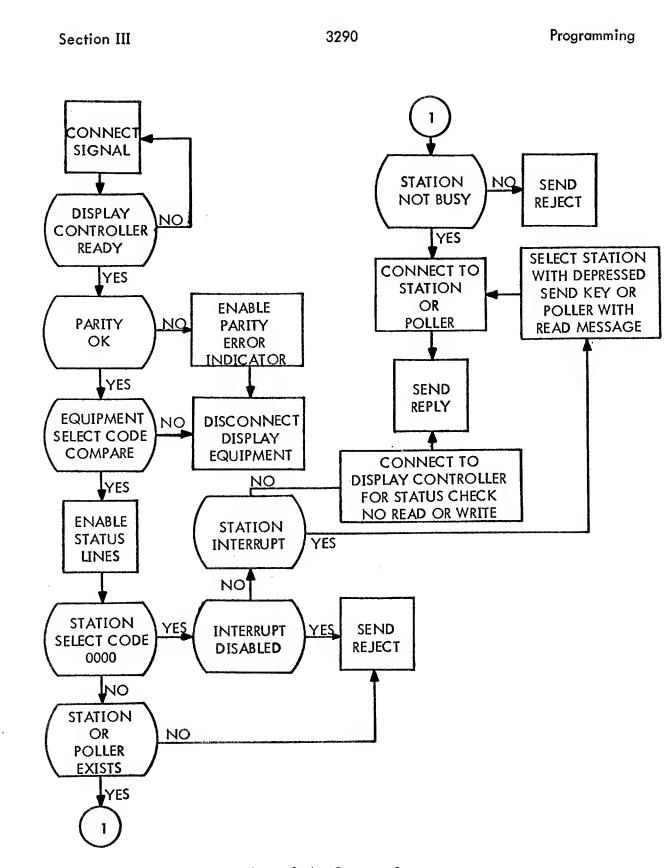


Figure 3-4. Connect Sequence

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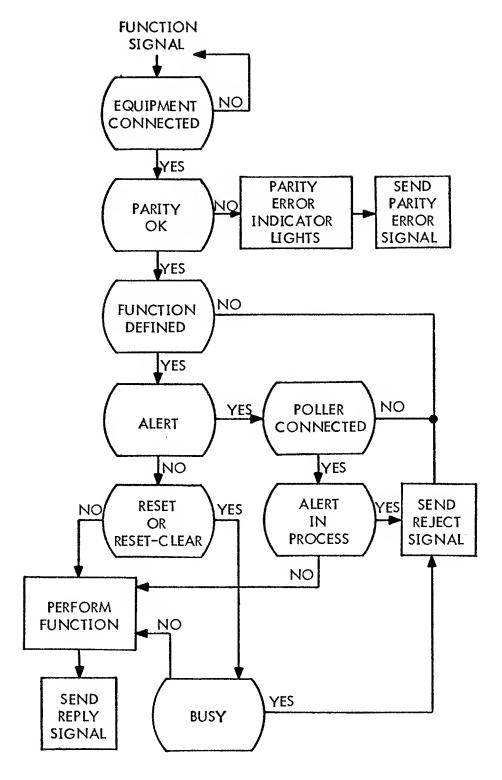


Figure 3-5. Function Sequence

neither be filled or emptied for the duration of the signal. The least significant 6 bits are unaffected; therefore, data transmission takes place in the form of one 6-bit word at a time.

# READ/WRITE OPERATIONS.

Read or write operations to or from a local Display Station may be performed any time at the discretion of the computer, after checking status. The computer-initiated action takes priority over the operator. If a read or write operation is initiated during a period when an operator is composing a message from the keyboard, the operator's keyboard is locked out and computer operation takes over. A read or write operation to a Display Station performing a printout results in termination of the printout and the read or write operation is performed at the specified Display Station.

The Display Controller allows the computer to enable an interrupt on an end of printout condition. Following connection to a specific Display Station and sampling status, print request status (line 3) is enabled if the Display Station requests a print operation or if it is presently performing a printout. Not ready status indicates the Display Station is actually performing a printout. Using function code 0020 octal, the computer may enable the select interrupt on ready and not busy condition. Upon completing printout, an interrupt is sent to the computer and status line 7 (ready and not busy interrupt) is made active. The 0020 function code enables an interrupt to generate when any Display Station completes printout.

Computer read and write operations do not take priority in the poller. The poller scans the remote stations to determine if a SEND key is depressed. If this condition exists, the selected station transmits a read message to the poller. After storing the message in memory, the poller generates a send request and the computer responds with a read operation. In response to the read message, the computer must send a write message to the selected poller. The poller then relays this message to the remote station.

The alert function turns on the ALERT light and audible alarm at the remote station; the SEND key must be depressed to turn them off. The subsequent read message enables the computer to perform a write operation.

Read operations may be initiated from the local or remote Display Stations by an operator depressing the SEND key or from the computer by programmed instructions (local Display Station only). A write operation is initiated only from the computer. Following is a description of read and write operations.

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## READ OPERATION INITIATED BY A REQUESTING STATION.

A requesting station is a local Display Station at which a SEND key was depressed, or a poller which received a read message from a remote station. At a requesting station an end of message symbol is inserted at the entry marker position, the entry marker is moved to the upper left corner, and a station interrupt is initiated if the station interrupt is enabled by the computer. The computer responds to the interrupt with a connect word containing a station select code of 00 octal. The Display Controller then connects to the requesting station in scanning sequence and activates the status lines. The computer must perform a read operation to clear the send request. If a read operation is not performed, the station interrupt is sent again upon receipt of the station interrupt enable.

The station word (shown in table 3-5), containing the number of the scanner selected requesting station, is sent in response to the first Data signal during a station-interrupt initiated read operation. If the selected requesting station is a poller, the remote site and station are indicated in bits 4 through 10. Successive words after the station word contain data stored in the delay line starting at the entry marker position.

When the end of message code is detected, it is sent to the computer in a data word. In response to the next Data signal following an end of message code, the End of Record signal accompanied by an all-zero data word is sent instead of the Reply signal. The Read signal terminates the read operation and becomes disabled for more than 200 nanoseconds. Data may therefore be read beyond the end of message code if the Read signal remains enabled. Figure 3-6 shows simplified read operation timing.

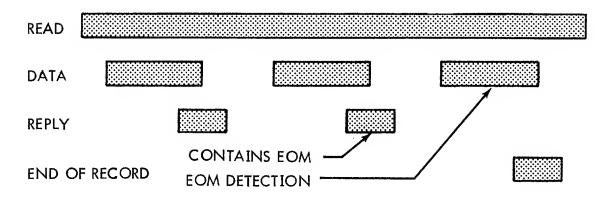


Figure 3-6. Simplified Read Timing

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If successive read operations are performed without resetting the entry marker (such as repetitive one-word reads) one symbol is lost each time the Read signal is dropped.

# READ OPERATION INITIATED BY THE COMPUTER.

The computer may initiate a read operation at any time the connected local Display Station or poller is not busy. Discretion is required in the use of this operation since it prevents entry of data by a Display Station operator. After connecting, the entry marker may be moved to the upper left corner by the reset function or may be left at its current position. In response to the Read and Data signals, data words are sent along with the Reply signal. A read operation performed on a connect to a specific station does not send the station word.

#### WRITE OPERATION TO A LOCAL DISPLAY STATION.

Data may be written into a connected station at any time the station is not busy. After connecting and checking status, the computer sends data words to be written on the crt starting at the position of the entry marker. A reset or reset-clear function may move the entry marker to the upper left corner before writing data. Sequential symbols in data words are written from left to right and from top to bottom on the crt. After the last symbol is written in the lower right corner, the entry marker moves to the upper left corner and data writing may continue, with the later data replacing data written earlier. Figure 3-7 shows simplified write operation timing.

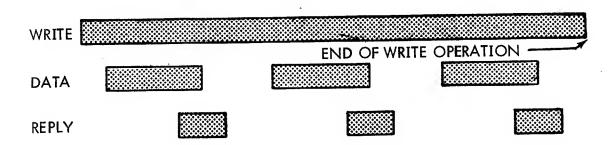


Figure 3-7. Simplified Write Timing

#### WRITE OPERATION TO A POLLER.

Data is always transferred to a poller after a read operation from the poller. After connecting to the poller and checking status, the computer sends data words

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to be written into the poller memory starting at the position of the entry marker. The entry marker is always at start-of-memory after any computer read operation.

A reset function immediately preceding a write to the poller results in a write-reset message from the poller to the remote station; a reset-clear function results in a clear-write message. No function results in write message. Sequential symbols in data words are written into the poller memory. The poller is informed that it is to send the message when the Write signal drops. The write, write-reset, or clear-write message is sent to the remote station which had just previously sent a read message.

# PROGRAMMING AIDS.

Following are several points concerning display equipment timing:

- (a) The Display Controller is busy for 33 microseconds after the last Reply signal is sent at the end of a write operation.
- (b) The Display Controller is busy from 3.2 microseconds to 20 milliseconds after receipt of a reset function.
- (c) If a read or write operation follows a reset function which transmits an interrupt upon completion, 20-millisecond delay (after the end of operation interrupt is sent) occurs before the first data word is stored or read from memory.
- (d) One symbol time is 16.8 microseconds. Each data word contains two symbols and requires 33.6 microseconds. The delay-line memory cycle time is 20 milliseconds. During a read or write operation, successive data words must follow within 33.6 microseconds (time required to read or write two symbols) or a 20-millisecond delay occurs between bytes due to delay line latency characteristics.

# PROGRAMMING RESTRICTIONS.

- (a) It is necessary to read at least two 12-bit words to clear the send ff when a connect is issued after an interrupt.
- (b) There should not be any unsolicited read or write operations (poller only).
- (c) Sending an end of print message to a Display Station initiates operation of its associated Printer Station(s).

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# POLLER TRANSLATION.

The poller converts all codes and signals to a format which is compatible with Data Set operation. Signals transmitted between the poller and the Data Set meet or exceed the minimum of EIA Standard RS-232. A negative voltage of greater than - 6 volts represents a logical 1; a positive voltage greater than +6 volts represents a logical 0. Half duplex, 2- or 4-wire operation, DATA-PHONE Data Set 201A or 201B service is required. Private communications lines are necessary and no provision is made for automatic ringing or answering.

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A single-phase, 120-volt, 60-Hz, three-wire outlet from the Display Controller is supplied for the Data Set, so the same ground bus is used for both. This measure is necessary to prevent impulse noise potentials which might otherwise develop and cause data errors.

The poller sends and receives data in an 8-bit code which is transmitted serially over Send Data and Receive Data lines. These bits are synchronized with the Serial Clock Receive and Serial Clock Transmit signals. Data Set 201A operates at 2000 baud, Data Set 201B at 2400 baud.

#### INTERFACE SIGNALS.

Figure 3–8 shows interface signals between the Data Set and the poller. The arrows indicate signal origin. Following paragraphs provide an elaboration on the signals shown in figure 3–8.

#### Send Data.

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The Send Data signal originates in the poller and contains serial data. Positive polarity represents a logical 0 and negative polarity represents a logical 1. Data bits are provided to the Data Set at the time of positive transition of the Serial Clock Transmit signal.

#### Request to Send.

The poller makes the Request to Send signal positive when a transmit operation is desired. Placing a negative potential on the line returns the Data Set to a receive condition.

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Figure 3-8. Poller Interface Signals

# Clear to Send.

The Data Set makes the Clear to Send signal positive in response to a Request to Send signal from the poller. The amount of time elapsed between the leading edge of the Request to Send and the leading edge of Clear to Send is determined by the Data Set strapping options. The Data Set makes the Clear to Send signal negative when the Request to Send signal drops.

# Interlock.

A +6 volts on the Interlock Line indicates that the Data Set is ready to send or receive data. A 0-volt signal indicates that the Data Set is not in an operating condition.

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# Serial Clock Transmit.

The Serial Clock Transmit signal is a symmetrical square wave of +6 volts to -6 volts amplitude originating in the Data Set which is used to synchronize the acceptance of data by the Data Set. Data is placed on the Send Data line at the time of the positive transition of the Serial Clock Transmit signal and is sampled by the Data Set at the time of negative transition.

## Receive Data.

The Receive Data signal contains serial binary data which is synchronized with the Serial Clock Receive signal. Positive polarity is defined as a logical 0 and negative polarity as a logical 1.

## Carrier On.

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A positive potential at the Carrier On terminal indicates that the Data Set is receiving the carrier. A negative potential indicates that no carrier is being received. The Carrier On signal changes from negative to positive within 9 milliseconds after carrier appears at the receiver terminal.

#### Remote Control.

A positive potential indicates that the poller is ready to communicate with the Data Set.

## Serial Clock Receive.

The Serial Clock Receive signal is a symmetrical square wave of +6 volts to -6 volts amplitude. The square wave is synchronized with the receiver timing circuits. Data bits on the Receive Data line are initiated synchronously with the positive transition of the Serial Clock Receive signal and are sampled at the negative transition.

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#### POLLER CONTROL CODES.

The basic poller codes are eight bits long and are used for communication between the poller and the remote sites. The most significant bit, which is received last serially, is the parity bit. Parity is odd. The following paragraphs list poller codes. Table 3-6 lists control codes and their octal translation.

TABLE 3-6. CONTROL CODES

DESCRIPTION	7-BIT OCTAL TRANSLATION
Start of Message (SOM)	001
USASCII End of Message (USASCII EOM)	003
Poll	005
Acknowledge (ACK)	006
Alert	007
Reset-Write	014
Write	021
Clear-Write	022
Read	023
Synchronization (SYNC)	026
Reject	030

## Start of Message.

The start of message code indicates that the next 7-bit word contains the site address. The start of message code follows the synchronization codes. It is both initiated and received by the poller.

# Alert.

The poller initiates the alert code when instructed by the computer. The alert code designates a message which turns on the ALERT light on the addressed remote site Display Station.

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# USASCII End of Message.

The USASCII end of message code indicates that the previous word was the last word of data. The word following the USASCII end of message code is the message parity word. This code is both initiated and received by the poller.

# Message Parity.

Message parity is applicable from the start of message through the USASCII end of message code, and excludes all sync codes. The message parity code is odd. The parity bit is excluded.

# Poll.

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The poller initiates the poll code which designates the poll message. The poll message instructs the remote site to respond with a read message if a SEND key has been depressed or a read request active is set or a reject message if the above two conditions do not exist.

# Acknowledge.

The acknowledge code originates at a remote site and designates a message which acknowledges receipt of a write, reset-write, clear-write, or alert message with no errors.

## Reset-Write.

The poller transmits the reset-write code when instructed by the computer. The code designates a message which instructs the addressed display equipment to write data starting at the upper left corner. The reset-write code is followed by 12 sync codes to allow time for the entry marker to reset.

## Write.

The poller initiates the write code when instructed by a computer message. The message contains data to be written on the remote crt starting at the current entry marker position.

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## Clear-Write.

The poller initiates the clear-write code when instructed by the computer. This code designates a message which instructs the addressed Display Station to clear data from the crt and write the contained data starting at the upper left corner. The poller transmits 12 sync codes following the clear-write code to allow time for the entry marker to reset.

#### Read.

The read code originates at a remote site and designates a message containing data on the Display Station crt which is to be sent to the computer.

# Synchronization.

The poller receives and transmits the sync code. Four sync codes are transmitted at the beginning of each message to assure receiver synchronization. These codes are not considered for purposes of message parity.

Sync codes also act as synchronization idles when contained within the message structure (reset-write and clear-write).

# Reject.

The reject code originates at a remote site. This code designates a message which informs the poller that a SEND key was not depressed, a read request active was not set before receipt of the poll message, or because of a busy condition, a write, reset-write or clear-write was rejected.

#### SYMBOL SUBSET.

The symbol subset codes (codes with bit 5 or 6 a logical 1, but not both) are stored in the delay-line memory and specify data presented or are displayed on the crt of a Display Station at a remote site. These codes are the data sent in read, write, reset-write, and clear-write messages.

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An escape code (76) followed by any code other than carriage return, E1, E2, or E3 codes will be converted to a space code (20 external BCD or 60 internal BCD). Refer to tables 3-7 and 3-8.

TABLE 3-7. SYMBOL SUBSET CONVERSION TO COMPUTER

INTERNAL CODE	EXTERNAL CODE	ESCAPE CODE RECEIVED
36	76	76 01 (CR)
37	77	76 02 (E1)
76	36	76 40 (E2)
75	35	76 41 (E3)

TABLE 3-8. SYMBOL SUBSET CONVERSION FROM COMPUTER

INTERNAL BCD	EXTERNAL BCD	ESCAPE CODE SENT
36	76	76 01 (CR)
37	77	76 02 (E1)
76	36	76 40 (E2)
75	35	76 41 (E3)

## Station Address.

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The station address code designates the remote site Display Station to which a poller is communicating. The station address in a read message is retained by the poller and sent to the computer. The next write, reset-write, or clear-write message from the computer to the poller is automatically sent to the Display Station from which the read message was received.

#### Site Address.

The site address code designates the remote site to which a message is addressed or from which a message is received. The remote sites polled are designated by site address switches on the Display Controller auxiliary maintenance panels. Polling takes place in numerical order.

#### MESSAGE FORMAT.

Messages received and sent by the poller consist of several codes. The general message format is shown in figure 3-9. All messages transmitted are preceded by four sync codes to assure synchronization recovery on the receiving end. The start of message code designates that the next code is the first word of the message. The site address and station address follow in that order. The control code defines the command or data which follows. Data to or from a remote Display Station may consist of 1 to 1040 words. The USASCII end of message code designates that the previous word was the last word of the message. The message parity code follows the end of message code. Message parity is applicable from the start of message through the end of message code inclusive and excludes all sync codes. Specific messages sent and received are listed in tables 3-9 and 3-10.

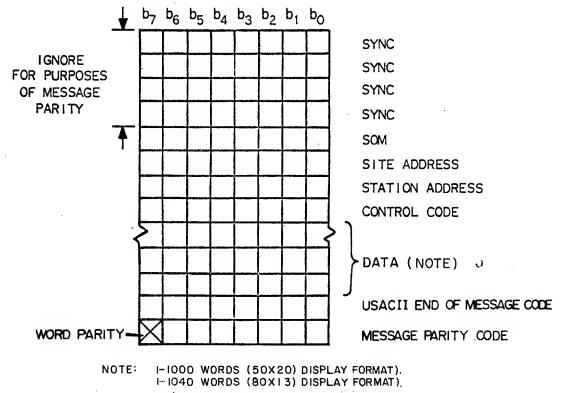


Figure 3-9. General Message Format

# Synchronization.

After the Data Set turns on the Carrier On signal, data input from the Data Set is fed into a buffer register. After each data bit is received, the contents of the buffer register is examined to determine if the code is a sync code. When two

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TABLE 3-9. MESSAGES SENT BY THE POLLER

TABLE 3-7.	MESSAGES SENT BY THE POLLER
MESSAGE	CODE
Alert	SYNC  4 Total  SYNC  START OF MESSAGE  SITE ADDRESS  STATION ADDRESS  ALERT  USASCII END OF MESSAGE  MESSAGE PARITY
Poll	SYNC  4 Total  SYNC  START OF MESSAGE  SITE ADDRESS  STATION ADDRESS  POLL  USASCII END OF MESSAGE  MESSAGE PARITY
Write	SYNC  4 Total  SYNC  START OF MESSAGE  SITE ADDRESS  STATION ADDRESS  WRITE  1 to 1000 * words of data  USASCII END OF MESSAGE  MESSAGE PARITY
Clear–Write  * 1040 w	SYNC  4 Total  SYNC  START OF MESSAGE SITE ADDRESS STATION ADDRESS  vords if 80 by 13 display format
1	

TABLE 3-9. MESSAGES SENT BY THE POLLER (CONT)

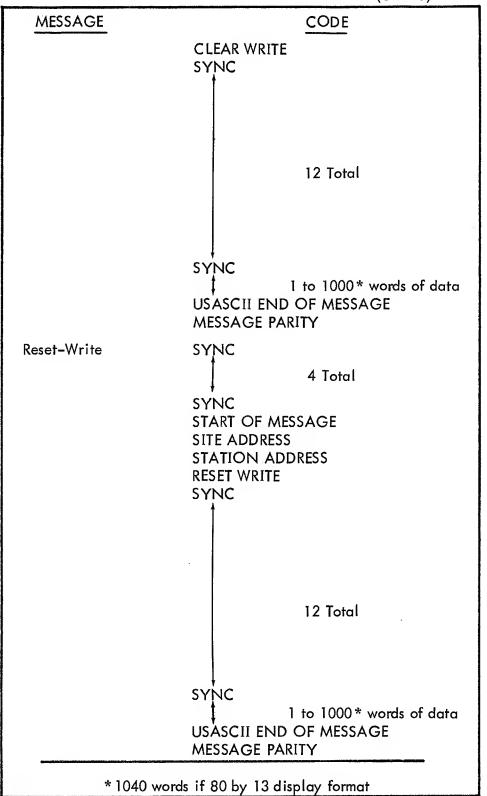
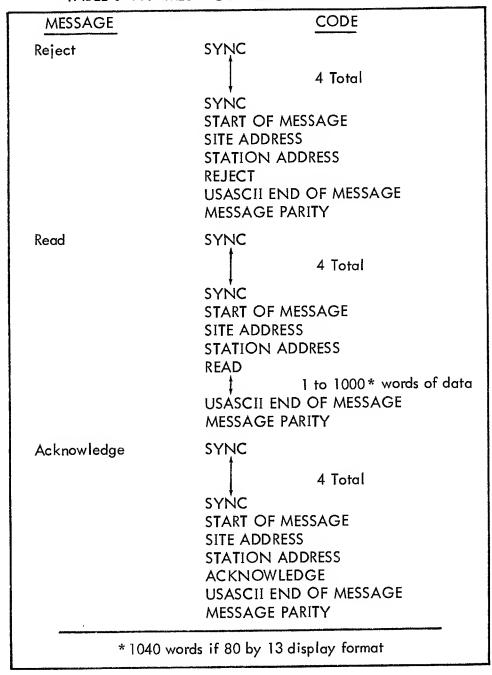


TABLE 3-10. MESSAGES RECEIVED BY THE POLLER



consecutive sync codes are detected, the poller assembles the next 8 bits and examines the contents to detect the start of message code. Unless at least two successive sync codes followed by a start of message code are detected, the poller again searches for the same pattern.

# Alert Message.

The computer cannot directly send a write, reset-write, or clear-write message to be written on a remote Display Station. It can indicate to a remote display equipment that the computer has a message to be written by initiating an alert message. The alert message is initiated by the computer as an alert function to the poller.

At the time the poller would normally poll a site, it determines if an alert function was received for that site. The poller then sends an alert message instead of a poll message. The remote Display Station, upon receipt of an alert message, lights the ALERT indicator and responds with an acknowledge message. Operator action (depress SEND key) is necessary before a write message can be sent.

# Polling.

The following description of the poller operation assumes that no error occurred while being transmitted over the DATA-PHONE and that the remote site is operating properly.

The poller is normally in a poll status during which time it sends periodic and sequential poll messages to the sites. If a SEND key is depressed at a site, the remote display equipment responds with a read message. If a SEND key is not depressed, the remote display equipment responds with a reject message. If a read message is received, it is transferred to the computer as a message from a local station would be transferred. The poller responds with a reset-write, write, or clear-write message addressed to the Display Station at which the SEND key was depressed. The poller sends the message to the remote Display Station. The remote display equipment responds to the reset-write, write, or clear-write message with an acknowledge message which completes the communication.

# Reject Message.

The reject message is a reply from a remote site to a poll message indicating that a SEND key was not depressed. The reject message also is used to inform the poller that the previous write, clear-write, reset-write or alert function was not performed. The poller interprets this as an error.

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# Read Message.

The read message is a reply from a remote site to a poll message indicating a SEND key was depressed. The data, read from the crt, begins at the upper left corner and terminates with the data subset end of message code. The read message enables send request status and the station interrupt. The computer then reads the site address and station address in the station word. After reading the station word, the computer may continue to read the rest of the data in the message or may send a write message immediately. The computer reading a data word clears the send request.

# Write Message.

The write message contains data from the computer to be written on the crt of a remote Display Station, starting at the present or reset entry marker position. A write, reset-write, or clear-write message is always sent in reply to a read message (with correct parity) from a remote site. After receiving a write message with correct channel parity from the computer, the poller switches to transmit and transfers the data to a remote site.

# Acknowledge Message.

If the message is an acknowledge in response to an alert message, alert request and poll interrupt status are set. The computer, upon reading status, is informed that the alert message was received by the remote Display Station. An acknowledge response to a write, reset-write, or clear-write message turns the site indicator off and the polling resumes.

## ERROR PROCESSING.

Errors may arise between the sending of a message to a remote site and receiving a message from a remote site. The poller recognizes these errors:

- (a) Lack of response before time out.
- (b) Parity error in a received message.
- (c) An unexpected response such as a read message in response to a write message.

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Any one of the error conditions causes the message to be retransmitted. The message is transmitted up to three times in attempting to get an error-free response. If, after three transmissions, an error-free response cannot be obtained, the poller ceases trying to communicate with that remote site.

If three attempts to successfully communicate an alert message to a remote display equipment fail, the Interrupt signal is enabled and the poller resumes polling. When the computer selects the poller, poll interrupt, poller error, and alert request status are indicated.

Three unsuccessful attempts to communicate a write, write-reset, or clear-write message to a remote site results in an Interrupt signal. Selection of the poller indicates poller error, station interrupt, and send request status. The computer must then read the station word. The computer may reread the station word, if it contained a parity error, by reconnecting to station 0. In order to clear the status bits and resume polling, it is necessary that the computer send a release function.

If a poll message cannot be successfully communicated in three attempts, the Interrupt signal is, again, enabled. When the poller is connected, it indicates send request, poll failure, and station interrupt status. The computer then reads the station word.

#### POLLER SYMBOL REPERTOIRE.

The poller communicates with a 7-bit code plus parity. The least significant bit (bit 0) is received first, and bit 7 is parity.

Codes with bit 6 or bit 5 (but not both) a logical 1 are stored in the delay-line memory associated with the connected poller. These codes are the data sent in read, write, reset-write, and clear-write communications with the remote sites. Remaining codes specify various functions, site address, and station address. Figure 3-10 lists symbol and function codes according to their binary translation.

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				NO	TE 1		DATA :	SUBSET	_			
			ь6	0	0	0	0	1	1	1	1	
		/	ь <sub>5</sub>	0	0	1	1	0	0	1	1	
ь <sub>3</sub>	ь <sub>2</sub>	Ь1	±4/60	0	1	0	1	0	1	0	1	
o d	0	0	0			- MINUS	+	: COLON	BLANK	STATION ADDRESS ON POLL	0	
0	0	0	1	SOM	WRITE	J (E3)	A	(CR)	/	1	1	
0	0	1	0		CLEAR- WRITE	к	8	2 (E1)	s	2	2	
0	0	1	1	U5 ASC11 EOM	READ	L	C	3	T	3	3 2	JKE33
0	1	0	0			м	D	4	υ	4	4	SIIE ADDRESS
0	1	0	1	POLL		Z	E	5	٧	5	5	
0	1	1	0	ACK	SYNC	0	F	6	w	ORESS	6	
0	1	1	1	ALERT		P	G	7	х	8 2 0 8 STATION ADDRESS	7	
1	0	0	0		REJECT	Q	н	8	Y	8 STAT		
1	0	0	1			R	1	9	z	9		
1	0	1	0			٧	<	ø	]	10		
1	0	1	1			ş	PERIOD	=	COMMA	11		
1	1	0	0			•	)	#	(	12		
1	1	0	1			t	2	≤				
1	1	1	0			+	ESCAPE	%				
1	1	1	1			>		С	٨			

#### NOTES:

- 1. Set aside for USASCII control codes.
- The lower portion of the four two-symbol data subset blocks are the interpretation of the codes when they immediately follow an escape code.

Figure 3-10. Symbol and Function Codes, Binary Translation



# APPENDIX I CONVERSION TABLES

TABLE 1A-1. POWERS OF 2

```
2"
                     2-"
                 n
                  0
              1
                     1.0
              2
                  1
                     0.5
                  2
              4
                     0.25
              8
                  3
                     0.125
                     0.062 5
             16
                  4
             32
                  5
                     0.031 25
                     0.015 625
             64
                  6
            128
                  7
                     0.007 812 5
            256
                  8
                     0.003 906 25
            512
                  9
                     0.001 953 125
          1 024
                     0.000 976 562 5
                 10
          2 048
                     0.000 488 281 25
                 11
          4 096
                     0.000 244 140 625
                 12
                     0.000 122 070 312 5
          8 192
                 13
         16 384
                 14
                     0.000 061 035 156 25
                     0.000 030 517 578 125
         32 768
                 15
                     0.000 015 258 789 062 5
         65 536
                 16
        131 072
                 17
                     0.000 007 629 394 531 25
                     0.000 003 814 697 265 625
        262 144
                 18
        524 288
                 19
                     0.000 001 907 348 632 812 5
                 20
                     0.000 000 953 674 316 406 25
      1 048 576
                      0.000 000 476 837 158 203 125
      2 097 152
                 21
                      0.000 000 238 418 579 101 562 5
      4 194 304
                 22
      8 388 608
                 23
                     0.000 000 119 209 289 550 781 25
                 24
                      0.000 000 059 604 644 775 390 625
     16 777 216
     33 554 432
                 25
                      0.000 000 029 802 322 387 695 312 5
                      0.000 000 014 901 161 193 847 656 25
     67 108 864
                 26
                      0.000 000 007 450 580 596 923 828 125
    134 217 728
                 27
                      0.000 000 003 725 290 298 461 914 062 5
    268 435 456
                 28
                      0.000 000 001 862 645 149 230 957 031 25
    536 870 912
                 29
                      0.000 000 000 931 322 574 615 478 515 625
  1 073 741 824
                 30
                      0.000 000 000 465 661 287 307 739 257 812 5
  2 147 483 648
                 31
                      0.000 000 000 232 830 643 653 869 628 906 25
                 32
  4 294 967 296
                      0.000 000 000 116 415 321 826 934 814 453 125
                 33
  8 589 934 592
                      0.000 000 000 058 207 660 913 467 407 226 562 5
 17 179 869 184
                 34
                      0.000 000 000 029 103 830 456 733 703 613 281 25
 34 359 738 368
                 35
                      0.000 000 000 014 551 915 228 366 851 806 640 625
 68 719 476 736
                 36
                      0.000 000 000 007 275 957 614 183 425 903 320 312 5
137 438 953 472
                 37
                      0.000 000 000 003 637 978 807 091 712 951 660 156 25
                 38
274 877 906 944
                      0.000 000 000 001 818 989 403 545 856 475 830 078 125
549 755 813 888
                 39
```

TABLE 1A-2. OCTAL-DECIMAL CONVERSION TABLE (SHEET 1 OF 4)

	0	1	2	3	4	5	5	7		0	1	2	3	4	5	6	7		
0000 0010 0020	0000 0008 0016	0001 0009 0017	0002 0010 0018	0003 0011 0019	0004 0012 0020	0005 0013 0021	0006 0014 0022	0007 0015 0023	0400 0410 0420	0256 0264 0272	0257 0265 0273	0258 0266 0274	0259 0267 0275	0260 0268 0276	0261 0269 0277	0262 0270 0278	0263 0271 0279	0000 to 0777	0000 to 0511
0030 0040 0050 0060	0024 0032 0040 0048	0025 0033 0041 0049	0026 0034 0042 0050	0027 0035 0043 0051	0026 0038 0044 0052	0029 0037 0045 0053	0030 0038 0046 0054	0031 0039 0047 0055	0430 0440 0450 0460	0280 0288 0296 0304	0281 0289 0297 0305	0282 0290 0298 0306	0263 0291 0299 0307	0284 0292 0300 0308	0285 0293 0301 0309	0286 0294 0302 0310	0287 0295 0303 0311	(Octal)	(Oecim
0070	0056	0057	0056	0059	0060	0081	0062 0070 0078	0083	0470 0500 0510	0312 0320 0328	031 <b>3</b> 0321 0329	0314 0322 0330	0315 0323 0331	0316 0324 0332	0317 0325 0333	0318 0326 0334	0319 0327 0335		- 6192
0110 0120 0130 0140	0072 0080 0088 0096	0073 0081 0089 0097	0074 0082 0090 0098	0075 0083 0091 0099	0076 0084 0092 0100	0077 0085 0093 0101	0086 0094 0102	0079 0087 0095 0103	0520 0530 0540	0338 0344 0352	0337 0345 0353	0338 0346 0354	0339 0347 0355	0340 0348 0356 0364	0341 0349 0357 0365	0342 0350 0358 0366	0343 0351 0359 0367	40000 50000	- 12288 - 16384 - 20480 - 24576
0150 0160 0170	0104 0112 0120	0105 0113 0121	0106 0114 0122	0107 0115 0123	0108 0118 0124	0109 0117 0125	0110 0118 0128	0111 0119 0127	0550 0580 0570	0380 0368 0378	0381 0369 0377	0362 0370 0378	0363 0371 0379	0372 0380	0373 0381	0374 0382	0375 0383		- 28672
0200 0210 0220 0230	0128 0136 0144 0152	0129 0137 0145 0153	0130 0138 0148 0154	0131 0139 0147 0155	0132 0140 0148 0158	0133 0141 0149 0157	0134 0142 0150 0158	0135 0143 0151 0159	0800 0810 0820 0630	0400	0385 0393 0401 0409	0386 0394 0402 0410	0387 0395 0403 0411	0388 0396 0404 0412	0389 0397 0405 0413	0390 0398 0406 0414	0391 0399 0407 0415		
0240 0250 0260 0270	0160 0188 0178 0184	0181 0189 0177 0185	0162 0170 0178 0188	0163 0171 0179 0187	0184 0172 0180 0188	0185 0173 0181 0189	0166 0174 0182 0190	0167 0175 0183 0191	0840 0850 0880	0418 0424 0432	0417 0425 0433 0441	0418 0428 0434 0442	0419 0427 0435 0443	0420 0428 0438 0444	0421 0429 0437 0445	0422 0430 0438 0448	0423 0431 0439 0447		
0300 0310 0320	0192 0200 0208	0193 0201 0209	0194 0202 0210	0195 0203 0211	0198 0204 0212	0197 0205 0213	0198 0208 0214	0199 0207 0215	0701 0711 0721	0448 0458	0449 0457 0485	0450 0458 0488	0451 0459 0487	0452 0460 0488	0453 0481 0469	0454 0462 0470	0455 0483 0471		
0330 0340	0218 0224	0217 0225	0218 0228	0218 0227	0220 0228 0238	0221 0229 0237	0214 0222 0230 0238	0213 0223 0231 0239	0731 0741	0472 0480	0473 0481 0489	0474 0482 0490	0475 0483 0491	0478 0484 0492	0477 0485 0493	0478 0488 0494	0479 0487 0495		
0350 0380	0232 0240	0233 0241	0234 0242	02 <b>3</b> 5 0243	0244	0245	0248	0247	0750 0780	0498	0497	0498	0499	0500	0501	0502	0503		
										0498	0497 0505	0498 0508	0499 0507	0500 0508	0501 0509	0502 0510	0503 0511		
0380	0240 0248	0241 0249	0242 0250	0243 0251	0244 0252	0245 0253	0248 0254	0247 0255	078	0498 0504	0505	0508	0507	0508	0509	0510	0511	]	
0380 0370	0240 0248 0 0 0512	0241 0249 1 0513	0242 0250 2 0514	0243 0251 3 0515	0244 0252 4 0516	0245 0253 5 0517	0248 0254 <b>6</b> 0518	0247 0255 7 0519	0780 0770	0498 0504 0 0	0505 1 0789	0508 2 0770	3 0771	0508 4 0772	0509 <b>5</b> 0773	0510 6 0774	7 0775	1000	
0380 0370 1000 1010 1020 1030	O 0248 O 0248 O 0512 O 0520 O 0528 O 538	0241 0249 1 0613 0521 0529 0537	0242 0250 2 0514 0522 0530 0538	0243 0251 3 0515 0523 0531 0639	0244 0252 4 0516 0524 0632 0540	0245 0253 6 0517 0525 0533 0541	0248 0254 6 0518 0528 0534 0542	0247 0255 7 0519 0527 0535 0543	0781 0771 1400 1410 1420 1430	0498 0504 0504 0788 0778 0784 0792	0505 1 0789 0777 0785 0793	2 0770 0778 0798 0794	3 0771 0779 0787 0795	0508 4 0772 0760 0788 0788	0509 5 0773 0781 0789 0787	0510 6 0774 0782 0780 0788	7 0775 0783 0791 0799	1000 to 1777 (Octal)	to 102
0380 0370 1000 1010 1020	O 0512 0528 0520 0528	0241 0249 1 0613 0521 0529	0242 0250 2 0514 0522 0530	0243 0251 3 0515 0523 0531	0244 0252 4 0516 0524 0632	0245 0253 6 0517 0525 0533	0248 0254 6 0518 0528 0534	0247 0255 7 0519 0527 0535	0781 0771 1400 1410 1420	0498 0504 0504 0788 0778 0784 0792	0505 1 0789 0777 0785	2 0770 0778 0798	3 0771 0779 0787	0508 4 0772 0760 0788	0509 5 0773 0781 0789	0510 6 0774 0782 0780	7 0775 0783 0791	to 1777	to 102
1000 1010 1020 1030 1040 1050 1070 1100 1110	O240 0248 0512 0520 0528 0538 0544 0652 0660 0589 0578 0578	0241 0249 1 0513 0521 0529 0537 0545 0553 0591 0589	0242 0250 2 0514 0522 0530 0538 0548 0554 0592 0570 0678 0688	0243 9251 3 0515 0523 0531 0639 0547 0565 0683 0571 0578 0587	0244 0252 4 0518 0524 0632 0540 0648 0558 0584 0572	0245 0253 5 0517 0525 0533 0541 0549 0557 0585 0573	0248 0254 0254 0518 0528 0534 0542 0550 0558	7 0255 7 0519 0527 0535 0543 0551 0558 0587 0575	078 077 077 1410 1411 1420 1430 1441 1450 1480	0498 0504 0788 0778 0784 0792 0800 0808 0818 0824	0505 1 0789 0777 0785 0793 0801 0809 0917	0508 2 0770 0778 0798 0794 0802 0810 0818	3 0771 0779 0787 0795 0803 0811 0819	0508 4 0772 0760 0788 0788 0804 0812 0820	0509 5 0773 0781 0789 0787 0805 0813 0821	0510 6 0774 0782 0780 0788 0806 0814 0922 0830 0838 0848 0854	7 0775 0783 0791 0799 0807 0915 0923 0831 0839 0847 0855	to 1777	to 102
1000 1010 1020 1030 1040 1050 1070	O240 0248 O248 O512 0520 0528 0538 0544 0552 0560 0589	0241 0249 1 0513 0521 0529 0537 0545 0553 0581 0589	2 0514 0522 0530 0538 0548 0548 0592 0570	0243 0251 3 0515 0523 0531 0639 0547 0565 0683 0571	0244 0252 4 0516 0524 0532 0540 0648 0558 0584 0572	0245 0253 6 0517 0525 0533 0541 0549 0557 0585 0573	0248 0254 0254 0518 0528 0534 0542 0550 0558 0568 0574	7 0255 7 0519 0527 0535 0543 0551 0558 0587 0575	078( 077) 140( 141( 142( 143( 1444) 145( 147( 150( 150( 151(	0498 0504 0788 0778 0784 0792 0800 0808 0818 0824 0832 0840 0848 0868	0505 1 0789 0777 0785 0793 0801 0809 0817 0825	0508 2 0770 0778 0798 0794 0802 0810 0818 0928	0507 3 0771 0779 0787 0795 0803 0811 0819 0827 0835 0843	0508 4 0772 0760 0788 0804 0812 0820 0829	0509 6 0773 0781 0789 0895 0813 0821 0829 0837 0845 0853 0889 0977	0510 6 0774 0782 0780 0788 0806 0814 0822 0830 0838 0848 0854 0882 0870 0878	7 0775 0783 0791 0807 0915 0923 0831 0839 0847 0855 0853 0871 0879	to 1777	to 102
0380 0370 1000 1010 1020 1030 1040 1060 1100 11100 1120 1130 1140 1150 1160 1170	0240 0248 0 0 0 0512 0520 0538 0544 0652 0660 0588 0598 0598 0598 0598 0698 0898 0898 0898 0898 0898	1 0241 0249 1 0513 0521 0529 0537 0545 0563 0581 0688 0677 0808 0801 0809 0817 0828	0242 0250 2 0514 0522 0530 0538 0554 0554 0582 0570 0678 0802 0810 0812 0828 0834	0243 0251 3 0515 0523 0531 0639 0547 0585 0883 0671 0619 0803 0811 0819 0827 0835	0244 0252 4 0516 0524 0832 0540 0548 0572 0580 0588 0588 0588 0588 0588 0588 058	0245 0253 6 0517 0525 0533 0641 0549 0557 0586 0573 0581 0808 0813 0821 0828 0837	0248 0254 0518 0528 0534 0542 0550 0550 0558 0666 0574 0682 0808 0604 0622 0830 0638	7 0519 0527 0537 0537 0543 0551 0589 0587 0581 0589 0807 0815 0823 0831 0838	1400 1410 1411 1421 1431 1441 1451 1501 1511 1521 1631 1541 1551	0498 0504 0788 0778 0784 0792 0800 0808 0818 0824 0832 0840 0848 0864 0872 0880	0505 1 0789 0777 0785 0785 0785 0801 0809 0917 0825 083 0841 0849 0857 0865 0873 0881	0508  2 0770 0778 0798 0794 0802 0810 0818 0928 0834 0842 0850 0858 0874 0892 0890	0507 0771 0778 0787 0785 0803 0811 0819 0827 0835 0843 0851 0858 0867 0976 0883 0891	0508 4 0772 0760 0788 0884 0812 0820 0829 0836 0844 0852 0868 0879 0884 0892	0509 5 0773 0781 0789 0797 0813 0821 0829 0837 0845 0853 0889 0977 0885 0883	0510 6 0774 0782 0780 0808 0814 0922 0830 0848 0848 0868 0870 0878 0888 0888	7 0775 0783 0791 0799 0807 0915 0923 0831 0839 0847 0855 0865 0871 0879 0887	to 1777	to 102
1000 1010 1020 1030 1040 1050 1060 1070 1110 1120 1130 1140 1140 1150 1140 1150 1140 1150 1120 1210 1220	0240 0248 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0241 0249 1 0513 0521 0537 0545 0553 0581 0588 0593 0801 0808 0817 0828 083 0841 0848 0857	0242 0250 2 0514 0522 0530 0558 0584 0582 0570 0610 0818 0828 0828 0834	0243 0251 3 0515 0523 0531 0531 0568 0583 0571 0688 0683 0611 0618 0827 0836 0831 0611 0618	0244 0252 4 0518 0524 0832 0540 0584 0572 0588 0588 0588 0812 0820 0838 0844 0852	0245 0253 5 0517 0255 0533 0541 0586 0573 0586 0587 0586 0813 0821 0829 0837	0248 0254 0518 0528 0534 0542 0550 0566 0574 0682 0830 0838 0806 0848 0854 0854 0854	7 0518 0527 0535 0543 0551 0558 0581 0581 0581 0581 0581 0583 0881 0588 0807 0816 0688 0807 0616 0668 0668 0668	1400 1411 1422 1433 1444 1456 1486 1470 1501 1611 1521 1631 1541 1561 1570	0488 0504 0788 0778 0784 0792 0800 0808 0818 0824 0832 0848 0888 0888 0898 0898 0898 0898 0898	0505  1 0789 0777 0786 0793 0808 0817 0825 0833 0841 0849 0887 0865 0873 0898	2 0770 0778 0794 0802 0810 0818 0842 0850 0850 0874 0882	3 0771 0779 0787 0786 0803 0811 0827 0835 0843 0851 0868 0883 0891	0508 4 0772 0760 0788 0804 0812 0820 0828 0836 0844 0952 0860 0879 0884 0892	0509 5 0773 0781 0787 0805 0813 0821 0828 0837 0846 0853 0877 0866 0883 0801 0809 080	0510 0774 0782 0780 0808 0814 0822 0830 0848 0864 0862 0870 0878 0888 0898 0898	7 0775 0783 0791 0789 0807 0815 0823 0831 0847 0865 0867 0879 0887 0896	to 1777	to 102
1000 1010 1020 1030 1040 1050 1060 1070 1100 11120 1130 1140 1150 1150 1210 1220 1230 1240 1250	0240 0248 0512 0520 0528 0538 0544 0582 0800 0808 0818 0824 0832 0840 0840 0848 0866 0864 0878	0241 0249 1 0513 0521 0529 0537 0545 0589 0877 0588 0801 0808 0817 0828 0833 0841 0849 0857 0866 0873	0242 0250 2 0514 0522 0530 0538 0544 0892 0819 0826 0834 0842 0850 0866 0874 0868	0243 0251 3 0515 0523 0531 0543 0547 0686 0883 0611 0618 0827 0835 0643 0668 0687 0688	0244 0252 4 0516 0524 0532 0540 0558 0558 0558 0804 0812 0820 0820 0820 0820 0820 0820 0820	0245 0253 0517 0525 0525 0533 0541 0587 0586 0573 0581 0883 0821 0828 0837 0846 0853 0851 0828 0857 0856 0857	0248 0254 0518 0528 0534 0552 0550 0558 0666 0574 0582 0688 0606 0614 0622 0830 0638 0648 0658 0658 0622 0630 0638	0247 0255 7 0519 0527 0535 0543 0551 0558 0587 0575 0683 0881 0889 0807 0816 0823 0831 0839	1400 1410 1410 1420 1431 1444 1451 1500 1611 1521 1631 1541 1555 1661 1611 1621 1631 1641 1651 1651 1651 1651 1651 1651 165	O O O O O O O O O O O O O O O O O O O	0505  1 0789 0777 0786 0793 0801 0808 0817 0825 0833 0841 0848 0857 0865 0883 0841 0989	2 0770 0778 0798 0798 0798 0810 0818 0828 0850 0850 0850 0850 0850 0850 085	0507 3 0771 0778 0787 0795 0803 0811 0819 0827 0835 0841 0858 0867 0868 0883 0891 0899 0807 0916 0923 0831 0928	0508 4 0772 0760 0788 0804 0812 0820 0828 0836 0844 0892 0800 0808 0816 0924 0932 0848	0509  5 0773 0781 0789 0797 0805 0813 0821 0828 0837 0845 0863 0883 0881 0893 0896 0893	0510 66 0774 0782 0780 0818 0814 0822 0830 0848 0848 0868 0878 0878 0878 0878 0878	7 0775 0783 0781 0798 0807 0815 0823 0831 0845 0847 0865 0863 0871	to 1777	to 102
1000 1000 1020 1030 1040 1050 1070 1100 1110 1120 1130 1150 1170 1220 1230 1240 1240	0240 0248 0512 0520 0528 0534 0652 0560 0588 0584 0592 0808 0818 0818 0844 0832 0848 0848 0848 0848	1 0513 0521 0521 0527 0536 0553 0581 0588 0677 0801 0801 0825 0833 0841 0849 0857 0866 0867	0242 0250 2 0514 0522 0530 0538 0554 0554 0570 0688 0894 0812 0812 0826 0834 0646 0866 0866 0866	0243 0251 3 0515 0523 0531 0587 0587 0587 0688 0011 0619 0827 0836 0641 0619 0827 0836 0659 0657 0659 0659 0659 0659	0244 0252 4 0516 0524 0532 0540 0558 0588 0588 0588 0804 0812 0820 0828 0838 0848 0856 0858 0858 0858 0858	0245 0253 0517 0525 0525 0533 0541 0588 0573 0581 0588 0583 091 022 0828 0837 0848 0853 0853 0853 0853 0853 0853 0853 085	0248 0254 0518 0528 0534 0542 0558 0566 0574 0582 0688 0806 0614 0622 0830 0638 0658 0658 0622 0630 0638	7 0518 0527 0535 0543 0551 0558 0581 0581 0581 0581 0582 0881 0588 0807 0606 0603 0871 0678 0666 0663 0871 0679 0687	1400 1411 1422 1433 1444 1453 1454 1450 1631 1641 1551 1561 1570 1801 1811 1622 1633 1644 1750	O O O O O O O O O O O O O O O O O O O	0505  1 0789 0777 0785 0793 0801 0809 0817 0825 0833 0841 0849 0857 0865 0873 0891 0929 0837 0946 0833	2 0770 0778 0798 0810 0928 0842 0850 0858 0868 0874 0890 08908 08908 08908 08908 08908 08908 08908 08908	0507 3 0771 0778 0787 0785 0803 0819 0827 0835 0843 0851 0867 0978 0871	0508 4 0772 0760 0788 0804 0812 0820 0828 0844 0852 0860 0868 0872	0509  5 0773 0781 0789 0787 0805 0813 0821 0828 0837 0846 0853 0881 0809 0817 0826 0833 0841 0848 0847	0510 0774 0782 0780 0814 0822 0830 0848 0854 0850 0870	7 0775 0783 0791 0807 0815 0823 0831 0847 0858 0863 0871 0895 0897	to 1777	051 to 102 {Oacin
1000 1010 1020 1030 1040 1050 1060 1070 1100 11120 1130 1140 1150 1210 1220 1230 1240 1250 1260 1270	0240 0248 0512 0520 0528 0538 0544 0582 0800 0808 0818 0824 0832 0840 0848 0866 0884 0878 0886 0888 0888	1 0513 0521 0529 0537 0545 0563 0581 0881 0807 0803 0801 0808 0807 0806 0877 0806 0877 0806 0877	0242 0250 2 0514 0522 0530 0538 0544 0892 0819 0826 0834 0842 0850 0866 0874 0868 0868 0874 0868	0243 0251 3 0515 0523 0531 0543 0547 0685 0883 0671 0619 0827 0835 0643 0658 0687 0688 0687 0688	0244 0252 4 0516 0524 0532 0540 0558 0558 0588 0804 0812 0820 0820 0820 0820 0806 0806 0806 080	0245 0253 0517 0525 0525 0533 0541 0587 0586 0573 0581 0688 0813 0821 0828 0837 0846 0853 0851 0859 0870 0868 0870 0888 0770	0248 0254 0518 0528 0534 0552 0550 0558 0568 0574 0582 0688 0806 0614 0622 0830 0848 0654 0670 0702	0247 0255 7 0519 0527 0535 0543 0551 0558 0587 0575 0683 0881 0889 0807 0816 0823 0831 0839 0847 0856 0663 0683 0683	0788 0777 1400 1410 1422 1433 1444 1455 1516 1521 1521 1521 1521 1521 1521 15	O488 0504 0788 0778 0784 0792 0800 0818 0824 0832 0840 0848 0894 0892 0890 0992 0898 0904 0818 0898	0505  1 0789 0777 0786 0793 0801 0808 0817 0825 0833 0841 0848 0857 0865 0883 0841 0989	2 0770 0778 0798 0798 0798 0810 0818 0828 0850 0850 0850 0850 0850 0850 085	0507 3 0771 0778 0787 0795 0803 0811 0858 0857 0858 0867 0868 0899 0807 0816 0883 0891 0899 0807 0816 0868 086	0508 4 0772 0760 0788 0804 0812 0820 0820 0836 0844 0892 0840 0848 0848 0848 0848	0509  5 0773 0781 0789 0797 0805 0813 0821 0829 0837 0845 0863 0881 0886 0883 087 087 087 087 087 087 087 0886	0510 0774 0782 0788 0806 0812 0822 0830 0848 0854 0862 0870 0888 0898	7 0775 0783 0791 0791 0807 0815 0823 0847 0856 0863 0871 0895 0895 0895	to 1777	to 102

TABLE 1A-2. OCTAL-DECIMAL CONVERSION TABLE (SHEET 2 OF 4)

		0	1	2	3	4	5	6	7	i	0	1	2	3	4	5	6	7
2000 1024 to to 2777 1535 (Octal Occimal)  Octal Occimal 10000 - 4096 20000 - 8192 30000 - 12288 40000 - 16384 50000 - 20480 60000 - 24576 70000 - 28672	2000 2010 2020 2030 2040 2050 2060 2070	1624 1032 1040 1048 1056 1064 1072 1080	1025 1033 1041 1049 1057 1065 1073 1081	1026 1034 1042 1050 1058 1066 1074 1082	1027 1035 1043 1051 1059 1067 1075 1083	1028 1036 1044 1052 1060 1068 1076 1084	1029 1037 1045 1053 1061 1069 1077 1085	1030 1038 1046 1054 1062 1070 1078 1086	1031 1039 1047 1055 1063 1071 1079 1087	2400 2410 2420 2430 2440 2450 2460 2470	1280 1288 1296 1304 1312 1320 1328 1336	1281 1289 1297 1305 1313 1321 1329 1337	1282 1290 1298 1306 1314 1322 1330 1338	1283 1291 1299 1307 1315 1323 1331 1339	1284 1292 1300 1308 1316 1324 1332 1340	1285 1293 1301 1309 1317 1325 1333 1341	1286 1294 1302 1310 1318 1326 1334 1342	1287 1295 1303 1311 1319 1327 1335 1343
	2100 2100 2120 2130 2140 2150 2160 2170	1088 1096 1104 1112 1120 1128 1136 1144	1089 1097 1105 1113 1121 1129 1137 1145	1090 1098 1108 1114 1122 1130 1138 1146	1091 1099 1107 1115 1123 1131 1139 1147	1092 1100 1108 1116 1124 1132 1140 1148	1093 1101 1109 1117 1125 1133 1141 1149	1094 1102 1110 1118 1126 1134 1142 1150	1095 1103 1111 1119 1127 1135 1143 1151	2500 2510 2520 2530 2540 2550 2560 2570	1344 1352 1360 1368 1376 1384 1392 1400	1345 1353 1361 1369 1377 1385 1393 1401	1346 1354 1362 1370 1378 1386 1394 1402	1347 1355 1363 1371 1379 1387 1395 1403	1348 1356 1364 1372 1380 1388 1396 1404	1349 1357 1365 1373 1381 1389 1397 1405	1350 1358 1366 1374 1382 1390 1398 1406	1351 1359 1367 1375 1383 1391 1399 1407
	2200 2210 2220 2230 2240 2250 2260 2270	1152 1160 1168 1176 1184 1192 1200 1208	1153 1161 1169 1177 1185 1193 1201 1209	1154 1162 1170 1178 1186 1194 1202 1210	1155 1163 1171 1179 1187 1195 1203 1211	1156 1164 1172 1180 1188 1196 1204 1212	1157 1165 1173 1181 1189 1197 1205 1213	1158 1166 1174 1162 1190 1198 1208 1214	1159 1167 1175 1183 1191 1199 1207 1215	2600 2610 2620 2630 2640 2650 2660 2670	1408 1416 1424 1432 1440 1448 1456 1484	1409 1417 1425 1433 1441 1449 1457 1465	1410 1418 1426 1434 1442 1450 1458 1466	1411 1419 1427 1435 1443 1451 1459 1467	1412 1420 1428 1436 1444 1452 1460 1468	1413 1421 1429 1437 1445 1453 1461 1469	1414 1422 1430 1438 1446 1454 1462 1470	1415 1423 1431 1439 1447 1455 1463 1471
	2300 2310 2320 2330 2340 2350 2360 2370	1216 1224 1232 1240 1248 1258 1264 1272	1217 1225 1233 1241 1249 1257 1265 1273	1218 1226 1234 1242 1250 1258 1266 1274	1219 1227 1235 1243 1251 1259 1287 1275	1220 1228 1236 1244 1252 1280 1268 1276	1221 1229 1237 1245 1253 1261 1269 1277	1222 1230 1238 1246 1254 1262 1270 1278	1223 1231 1239 1247 1255 1283 1271 1279	2700 2710 2720 2730 2740 2750 2760 2770	1472 1480 1488 1496 1504 1512 1520 1528	1473 1481 1489 1497 1505 1513 1521 1529	1474 1482 1490 1498 1506 1514 1522 1530	1475 1483 1491 1499 1507 1515 1523 1531	1476 1484 1492 1500 1508 1516 1524 1532	1477 1485 1493 1501 1519 1517 1525 1533	1478 1486 1494 1502 1510 1518 1526 1534	1479 1487 1495 1503 1511 1519 1527 1535
		0	1	2	3	4	5	6	7		0	1	2	3	4	5	6	7
3000 1536 to to 3777 2047 Octal) (Oecimal)	3000 3010 3020 3030 3040 3050 3080 3070	1536 1544 1552 1560 1568 1578 1584 1592	1537 1545 1553 1561 1569 1577 1585 1593	1538 1546 1554 1562 1570 1578 1588 1594	1539 1547 1555 1563 1571 1579 1587 1586	1540 1548 1556 1564 1572 1580 1588 1596	1541 1549 1557 1565 1573 1581 1589 1597	1542 1550 1558 1566 1574 1582 1590 1598	1543 1551 1559 1587 1575 1583 1591 1599	3400 3410 3420 3430 3440 3450 3460 3470	1792 1800 1808 1816 1824 1832 1840 1848	1793 1801 1809 1817 1825 1833 1841 1849	1794 1802 1810 1818 1826 1834 1842 1850	1795 1803 1811 1818 1827 1835 1843 1851	1796 1804 1812 1820 1828 1836 1844 1852	1797 1805 1813 1821 1829 1837 1845 1853	1798 1806 1814 1822 1830 1838 1848 1854	1799 1807 1815 1823 1831 1839 1847 1855
	3100 3110 3120 3130 3140	1600 1808 1816 1624 1832 1640	1801 1809 1617 1625 1633 1641 1849	1602 1610 1618 1626 1834 1842 1650 1858	1603 1811 1619 1827 1635 1643 1651 1659	1604 1612 1620 1828 1836 1844 1652 1660	1605 1613 1621 1629 1637 1645 1653 1681	1806 1614 1622 1630 1638 1646 1654 1662	1607 1615 1623 1831 1639 1847 1655 1883	3500 3510 3520 3530 3540 3550 3560 3570	1856 1864 1872 1880 1888 1896 1904 1912	1857 1865 1873 1881 1889 1897 1905 1913	1858 1866 1874 1882 1890 1898 1908	1859 1867 1875 1883 1891 1899 1907	1860 1868 1878 1884 1892 1900 1908	1861 1889 1877 1885 1893 1901 1909 1917	1862 1870 1878 1888 1894 1902 1910	1863 1871 1879 1887 1895 1903 1911 1919
	3150 3160 3170	1648 1856	1657	1090					- 1					1923	1924	1925	1926 1934	1927 1935
	3150 3160		1657 1685 1873 1881 1888 1887 1705 1713 1721	1668 1874 1882 1890 1698 1706 1714	1687 1675 1683 1891 1899 1707 1715 1723	1868 1878 1884 1892 1700 1708 1718	1669 1877 1685 1893 1701 1709 1717	1670 1678 1888 1894 1702 1710 1718 1728	1871 1879 1687 1895 1703 1711 1719 1727	3800 3810 3620 3830 3640 3850 3880 3670	1920 1928 1936 1944 1952 1980 1988 1978	1921 1929 1937 1945 1953 1981 1889 1977	1922 1930 1938 1948 1954 1982 1970 1978	1931 1939 1947 1955 1983 1971 1979	1932 1940 1948 1958 1984 1972 1980	1933 1941 1949 1957 1965 1973 1981	1942 1950 1958 1986 1974 1882	1943 1951 1959 1987 1975 1983

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TABLE 1A-2. OCTAL-DECIMAL CONVERSION TABLE (SHEET 3 OF 4)

	0	1	2	3	4	5	6	7		0	1	2	3	4	5	6	7		
4000	2048	2049	2050	2051	2052	2053	2054	2055	4400	2304	2305	2306	2307	2308	2309	2310	2311	4000	20
4010	2056	2057	2056	2059	2060	2061	2062	2063	4410	2312	2313	2314	2315	2316	2317	2318	2319	to	ž t
4020	2064	2065	2066	2067	2068	2069	2070	2071	4420	2320	2321	2322	2323	2324	2325	2326	2327	4777	25
4030	2072	2073	2074	2075	2076	2077	2078	2079	4430	2328	2329	2330	2331	2332	2333	2334	2335	(Octal)	(Oec
<b>4040</b> <b>4</b> 050	2080 2088	2081 2089	2082 2090	2083 2091	2084 2092	20 <b>6</b> 5 2093	2086 2094	2087 2095	4440 4450	2336	2337 2345	2338 2346	2339 2347	2340 2348	2341 2349	2342 2350	2343	, scrait	,000
4060	2096	2003	2098	2099	2100	2101	2102	2103	4460	2352	2353	2354	2355	2348	2349	2350	2351 2359		
4070	2104	2105	2106	2107	2108	2109	2110	2111	4470	2360	2361	2362	2363	2364	2365	2366	2367	Octal	0ecim
																		10000	
4100	2112	2113	2114	2115	2116	2117	2118	2119	4500	2368	2369	2370	2371	2372	2373	2374	2375	20000	
4110 4120	2120 2128	2121 2129	2122 2130	2123 2131	2124 2132	2125 2133	2126 2134	2127	4510		2377	2378	2379	2380	2381	2382	2383	30000	
4130	2136	2137	2138	2139	2140	2141	2142	2135 2143	4520 4530	2384	23 <b>6</b> 5 2393	2386 2394	2387 2395	2388 2396	2389 2397	239 <b>0</b> 2398	2391 2399	40000	- 1638
4140	2144	2145	2146	2147	2148	2149	2150	2151	4540	2400	2401	2402	2403	2404	2405	2406	2407	50000	- 2048
4150	2152	2153	2154	2155	2156	2157	2158	2159	4550	2408	2409	2410	2411	2412	2413	2414	2415	60000	- 245
4160	2160	2161	2162	2163	2164	2165	2166	2167	4560	2416	2417	2418	2419	2420	2421	2422	2423	70000	- 286
4170	2168	2169	2170	2171	2172	2173	2174	2175	4570	2424	2425	2426	2427	2428	2429	2430	2431		
4200	2176	2177	2178	2179	2180	2161	2182	2183	4600	2432	2433	2434	2435	2436	2437	2438	2439		
4210	2184	2185	2186	2187	2188	2189	2190	2191	4610	2440	2441	2442	2443	2444	2445	2446	2447		
4220 4230	2192 2200	2193 2201	2194 2202	2195 2203	2196 2204	2197 2205	2198 2206	2199 2 <b>207</b>	4620 4630	2448	2449 2457	2450 2458	2451 2459	2452 2460	2453 2461	2454 2462	2455 2463		
4240	2208	2209	2210	2211	2212	2213	2214	2215	4640	2464	2465	2456	2467	2468	2469	2470	2403		
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5010 5020 5030 5040 5050 5050 5070 5100 5110 5120 5130 5140 5150 5160 5170 5200 5220 5230	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2688 2696 2696 2712	2561 2569 2575 2585 2593 2601 2609 2617 2625 2633 2641 2857 2665 2673 2681 2889 2897 2705 2713	2562 2570 2578 2586 2594 2602 2610 2618 2626 2634 2642 2650 2658 2666 2674 2882 2690 2698 2714	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2659 2667 2675 2683 2691 2691 2697 2715	2584 2572 2580 2588 2596 2604 2612 2620 2628 2636 2644 2652 2680 2668 2676 2684 2692 2700 2708 2716	2585 2573 2587 2589 2597 2605 2613 2621 2629 2637 2645 2653 2661 2669 2677 2685 2693 2709 2717	2566 2574 2582 2590 2598 2606 2614 2622 2630 2638 2846 2654 2662 2670 2678 2686 2694 2710 2718	2567 2575 2583 2591 2599 2607 2615 2623 2631 2639 2647 2655 2663 2671 2679 2687 2695 2703 2711 2719	5410 5420 5430 5440 5450 5470 5510 5520 5530 5540 5570 5610 5620 5630	2616 2874 2832 2840 2848 2856 2864 2872 2880 2888 2896 2904 2912 2920 2928 2936 2944 2950 2960 2968	2617 2825 2833 2641 2849 2857 2865 2873 2881 2889 2997 2905 2913 2921 2929 2937 2945 2953 2951 2969	2818 2826 2834 2842 2850 2858 2866 2874 2882 2890 2996 2914 2922 2930 2938 2946 2954 2954 2962	2819 2827 2835 2843 2851 2859 2867 2875 2883 2891 2899 2907 2915 2923 2931 2939 2947 2955 2963 2971	2620 2828 2836 2844 2852 2860 2868 2876 2884 2892 2908 2916 2924 2932 2940 2946 2956 2956 2956 2956 2956 2956 2956 295	2821 2629 2837 2845 2853 2861 2869 2877 2885 2893 2909 2917 2925 2933 2941 2949 2957 2965 2973	2822 2830 2838 2846 2854 2862 2870 2878 2886 2894 2901 2918 2926 2934 2942 2950 2958 2956 2958 2968 2974	2823 2831 2839 2847 2855 2863 2871 2879 2887 2993 2911 2919 2927 2935 2943 2951 2951 2967 2975	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5050 5050 5070 5110 5110 5120 5130 5150 5170 5200 5200 5220 5220 5230 5240	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2688 2696 2704	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2642 2657 2665 2673 2681 2889 2897 2705 2713 2713	2562 2570 2578 2586 2586 2594 2602 2610 2618 2626 2650 2658 2664 2882 2690 2698 2706 2714 2712	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2659 2683 2691 2699 2707 2715 2715 2715 2723	2584 2572 2580 2588 2596 2601 2620 2628 2636 2644 2652 2686 2676 2684 2692 2700 2708 2718 2724	2585 2573 2589 2589 2597 2605 2613 2621 2629 2637 2645 2653 2669 2677 2685 2693 2701 2709 2717 2725	2566 2574 2582 2590 2598 2606 2614 2622 2630 2638 2846 2654 2662 2670 2678 2688 2694 2710 2718 2718 2718	2567 2575 2583 2697 2615 2623 2631 2639 2647 2655 2663 2671 2679 2687 2695 2703 2711 2719	5410 5420 5430 5440 5450 5460 5510 5520 5530 5580 5610 5620 5630 5640	2816 2874 2832 2840 2848 2856 2864 2872 2880 2988 2994 2912 2920 2928 2936 2944 2952 2960 2968 2968 2978	2617 2825 2833 2841 2849 2857 2865 2873 2881 2889 2897 2905 2913 2921 2929 2937 2945 2953 2961 2961 2961 2977	2616 2826 2834 2842 2850 2858 2866 2874 2882 2890 2898 2906 2914 2922 2930 2936 2946 2954 2962 2970 2976	2819 2827 2635 2843 2851 2859 2867 2875 2883 2891 2899 2907 2915 2923 2931 2939 2947 2955 2963 2971 2979	2620 2828 2836 2844 2852 2860 2868 2876 2884 2990 2908 2918 2924 2932 2940 2946 2956 2967 2967 2980	2821 2629 2837 2845 2853 2861 2869 2877 2885 2901 2909 2917 2925 2933 2941 2949 2957 2967 2967 2967 2967 2973 2981	2822 2830 2838 2846 2854 2867 2878 2886 2894 2902 2910 2918 2926 2934 2942 2950 2958 2956 2974 2982	2823 2831 2839 2847 2855 2863 2871 2879 2887 2993 2911 2919 2927 2935 2943 2951 2959 2967 2975 2983	to 5 <b>77</b> 7	3
5010 5020 5030 5030 5050 5060 5070 5100 5110 5150 5150 5160 5170 5160 5170 5180 5180 5180 5180 5180 5180 5180 518	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2688 2696 2704 2712 2772	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2649 2673 2681 2889 2897 2713 2721 2721 2722 2737	2562 2570 2586 2594 2610 2618 2626 2634 2658 2658 2668 2674 2882 2698 2706 2714 2722 2730 2738	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2687 2687 2683 2699 2707 2715 2723 2731 2731	2584 2580 2580 2588 2596 2604 2612 2620 2628 2636 2644 2652 2680 2684 2692 2708 2716 2716 2716 2716 2716 2716 2716 2716	2585 2573 2587 2589 2597 2605 2613 2621 2629 2637 2645 2653 2661 2669 2677 2685 2693 2709 2717	2566 2574 2582 2590 2598 2606 2614 2622 2630 2638 2846 2654 2662 2670 2678 2686 2694 2710 2718	2567 2575 2583 2591 2599 2607 2615 2623 2631 2639 2647 2655 2663 2671 2679 2687 2695 2703 2711 2719	5410 5420 5430 5440 5450 5470 5510 5520 5530 5540 5570 5610 5620 5630	2616 2874 2832 2840 2848 2856 2864 2872 2880 2888 2896 2904 2912 2920 2928 2936 2944 2950 2960 2968	2617 2825 2833 2641 2849 2857 2865 2873 2881 2889 2997 2905 2913 2921 2929 2937 2945 2953 2951 2969	2818 2826 2834 2842 2850 2858 2866 2874 2882 2890 2996 2914 2922 2930 2938 2946 2954 2954 2962	2819 2827 2835 2843 2851 2859 2867 2875 2883 2891 2899 2907 2915 2923 2931 2939 2947 2955 2963 2971	2620 2828 2836 2844 2852 2860 2868 2876 2884 2892 2908 2916 2924 2932 2940 2946 2956 2956 2956 2956 2956 2956 2956 295	2821 2629 2837 2845 2853 2861 2869 2877 2885 2893 2909 2917 2925 2933 2941 2949 2957 2965 2973	2822 2830 2838 2846 2854 2862 2870 2878 2886 2894 2901 2918 2926 2934 2942 2950 2958 2956 2958 2968 2974	2823 2831 2839 2847 2855 2863 2871 2879 2887 2993 2911 2919 2927 2935 2943 2951 2951 2967 2975	to 5 <b>77</b> 7	3
5010 5020 5030 5030 5040 5050 5060 5070 5100 5110 5120 5130 5150 5170 5200 5210 5220 5220 5220 5220 5220 522	2560 2568 2576 2584 2592 2600 2616 2624 2632 2640 2656 2664 2656 2664 2672 2880 2686 2704 2712 2720 2728	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2649 2857 2665 2673 2681 2889 2713 2712 2712 2722	2562 2570 2578 2586 2594 2602 2618 2628 2634 2634 2650 2654 2882 2890 2698 2714 2722 27722	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2667 2667 2683 2691 2707 2715 2723 2723 2723	2584 2572 2588 2598 2598 2604 2612 2620 2636 2644 2652 2686 2676 2684 2706 2708 2716 2718 2724 2732	2585 2573 2581 2589 2597 26025 2613 2621 2629 2637 2645 2853 2669 2677 2685 2701 2717 2709 2717 2725 2733	2566 2574 2582 2590 2598 2606 2614 2622 2630 2638 2846 2654 2667 2670 2718 2710 2718 2716 2716 2716 2716 2716 2716 2716	2567 2575 2583 2591 2599 2607 2615 2623 2631 2639 2647 2655 2667 2679 2687 2703 2711 2719 2712 2727 2727 2735	5410 5420 5430 5440 5450 5460 5510 5520 5530 5560 5570 5610 5620 5630 5640 5640	2816 2874 2832 2840 2848 2856 2864 2872 2880 2888 2996 2912 2920 2928 2936 2944 2952 2960 2968 2978 2984	2817 2825 2833 2841 2849 2857 2865 2873 2881 2905 2913 2921 2929 2937 2945 2953 2968 2969 2977 2985	2818 2826 2834 2850 2858 2866 2874 2882 29906 2914 2922 2930 2938 2946 2954 2962 2978 2978	2819 2827 2835 2843 2851 2859 2867 2892 2907 2915 2923 2931 2939 2947 2955 2963 2971 2987	2820 2828 2836 2844 2852 2868 2876 2990 2918 2912 2924 2932 2940 2948 2956 2964 2972 2980 2988	2621 2629 2837 2845 2853 2861 2869 2877 2885 2893 2901 2901 2917 2925 2933 2941 2949 2957 2965 2973 2981 2989	2822 2830 2838 2846 2854 2870 2870 2910 2918 2912 2914 2926 2934 2942 2950 2958 2966 2974 2982 2982 2982 2982	2823 2831 2839 2847 2855 2863 2871 2879 2887 2895 2903 2919 2927 2935 2943 2951 2959 2967 2975 2983 2991	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5050 5070 5110 5120 5130 5130 5140 5150 5200 5200 5220 5220 5220 5220 522	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2704 2712 2720 2728 2738 2744 2752	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2857 2681 2897 2705 2713 2721 2713 2721 2737 2745	2562 2578 2586 2594 2610 2618 2626 2634 2650 2658 2674 2882 2690 2716 2722 2738 2746 2754	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2675 2683 2691 2797 2715 2723 2731 2732 2747	2564 2572 2580 2588 2596 2604 2612 2620 2636 2636 2636 2636 2676 2708 2716 2724 2732 2740 2748	2585 2573 2581 2589 2597 2605 2613 2621 2629 2637 2645 2653 2661 2667 2685 2701 2708 2717 2723 2741 2749 2757	2566 2574 2582 2590 2598 2614 2622 2830 2638 2846 2854 2670 2678 2688 2702 2710 2718 2726 2736 2742 2750	2567 2575 2575 2591 2599 2607 2615 2623 2631 2639 2647 2655 2667 2679 2711 2711 2711 2727 2737 2743 2751	5410 5420 5430 5440 5450 5450 5510 5520 5530 5540 5550 5600 5610 5620 5630 5640 5680 5680	2816 2874 2832 2840 2848 2856 2864 2812 2890 2912 2920 2928 2936 2944 2952 2960 2968 2978 2992 3000	2617 2825 2825 2833 2641 2849 2857 2865 2873 2891 2992 2937 2929 2937 2945 2953 2969 2977 2969 2977 2969 2973 3001	2618 2826 2834 2842 2850 2858 2866 2874 2890 2914 2930 2938 2946 2952 2970 2978 2988 2994 3002	2819 2827 2835 2843 2851 2867 2875 2893 2907 2915 2923 2931 2939 2947 2955 2963 2971 2979 2995 3003	2820 2838 2836 2844 2852 2860 2868 2876 2900 2908 2914 2932 2944 2952 2954 2954 2958 2964 2972 2980 2980 2980 3004	2821 2829 2837 2845 2863 2861 2869 2877 2909 2917 2909 2917 2929 2933 2941 2957 2965 2973 2981 2981 2997 3005	2822 2830 2838 2846 2854 2862 2870 2878 2891 2910 2918 2912 2926 2934 2942 2950 2950 2950 2950 2950 2950 2950 295	2823 2831 2839 2847 2855 2863 2871 2879 2895 2903 2911 2919 2955 2943 2951 2957 2957 2967 2975 2983 2993 3007	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5060 5070 5100 5110 5120 5130 5140 5150 5210 5220 5230 5240 5250 5270	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2648 2655 2648 2672 2880 2704 2712 2728 2738 2744	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2649 2857 2665 2673 2681 2889 2713 2713 2729 2737 2745	2562 2570 2586 2598 2594 2602 2610 2618 2642 2650 2658 2658 2664 2882 2706 2714 2730 2738 2746	2563 2571 2595 2587 2595 2603 2611 2619 2627 2635 2643 2651 2659 2707 2715 2699 2707 2712 2731 2739 2747	2584 2572 2580 2588 2596 2604 2612 2620 2638 2644 2668 2676 2684 2700 2708 2716 2732 2740 2748	2585 2573 2581 2589 2597 2605 2613 2621 2629 2637 2645 2663 2677 2685 2701 2708 2717 2717 2717 2717 2717 2717 2717 271	2566 2574 2582 2590 2598 2694 2614 2622 2630 2638 2654 2662 2670 2686 2710 2718 2712 2712 2714 2750	2567 2575 2583 2591 2697 2615 2623 2631 2639 2647 2655 2663 2671 2719 2711 2719 2727 2735 2743 2751	5410 5420 5430 5440 5450 5460 5510 5520 5530 5540 5560 5610 5620 5630 5640 5650 5680 5680	2816 2874 2832 2840 2848 2856 2864 2872 2888 2896 2904 2912 2920 2928 2936 2944 2952 2960 2968 2984 2992 2984 2992 2986 2984 2992 2986	2817 2825 2833 2841 2849 2857 2865 2973 2891 2995 2913 2921 2929 2937 2945 2953 2981 2989 2995 2993 3001	2818 2826 2834 2852 2858 2858 2896 2914 2922 2930 2938 2946 2954 2954 2954 2954 2954 2954 2954 2954	2819 2827 2635 2843 2851 2869 2867 2893 29907 2915 2923 2931 2931 2931 2939 2947 2955 2963 2971 2997 2997 2997 2997	2820 2828 2836 2844 2850 2860 2868 2876 2990 2990 2916 2924 2932 2932 2940 2948 2956 2956 2956 2964 2978 2988 2996 3004	2821 2829 2837 2845 2863 2861 2869 2877 2885 2991 2991 2917 2917 2925 2933 2941 2949 2965 2973 2989 2989 2989 3005	2822 2830 2838 2846 2854 2862 2870 2910 2918 2929 2934 2934 2950 2958 2958 2974 2990 2998 3008	2823 2831 2839 2647 2863 2871 2879 2895 2903 2911 2927 2935 2943 2959 2967 2978 2989 3007	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5060 5070 5100 5110 5120 5140 5140 5170 5220 5220 5220 5220 5220 5230 5230 523	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2704 2712 2720 2720 2738 2744 2752 2788 2788 2788 2778	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2857 2665 2673 2681 2897 2711 2721 2712 2713 2721 2737 2745 2753 2761 2769 2769 2769 2777	2562 2578 2586 2594 2610 2618 2626 2634 2650 2654 2882 2690 2716 2722 2738 2746 2754 2754 2754 2775 2778	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2697 2675 2683 2691 2797 2715 2723 2737 2747 2755 2783 2771 2778	2564 2572 2580 2588 2596 2604 2612 2620 2684 2652 2684 2790 2716 2724 2714 2748 2758 2784 2784 2784 2784 2784 2784 2784 278	2585 2573 2581 2589 2597 2605 2613 2621 2629 2637 2645 2653 2661 2665 2677 2685 2701 2712 2708 2717 2723 2741 2749 2757 2765 2773 2781	2566 2574 2582 2590 2598 2614 2622 2830 2638 2846 2854 2670 2678 2710 2716 2726 2736 2742 2750 2758	2567 2575 2583 2591 2599 2607 2615 2623 2631 2639 2647 2655 2667 2703 2711 2719 2727 2735 2743 2751 2755 2763 2765 2767 2775 2775 2783	5410 5420 5430 5440 5450 5450 5510 5520 5530 5540 5550 5600 5610 5610 5620 5630 5640 5650 5680 5670	2816 2874 2840 2848 2856 2864 2817 2880 2918 2910 2912 2928 2936 2944 2952 2968 2978 2988 2978 2992 3000	2617 2825 2825 2833 2641 2849 2857 2865 2873 2891 2992 2937 2952 2953 2953 2969 2977 2969 2977 2969 2973 3001 3009 3017 3009 3013	2618 2826 2834 2842 2850 2858 2866 2874 2892 2994 2994 2954 2954 2962 2970 2978 2988 2994 3010 3018 3018 3028 3034	2819 2827 2835 2843 2851 2867 2875 2893 2907 2915 2923 2931 2939 2947 2955 2963 2971 2995 3003	2820 2838 2836 2844 2852 2860 2868 2876 2900 2908 2914 2932 2944 2952 2984 2954 2964 2972 2980 2996 3004	2821 2829 2837 2845 2863 2861 2869 2877 2885 2991 2909 2917 2925 2933 2941 2957 2965 2973 2989 2997 3005	2822 2830 2838 2846 2854 2862 2870 2878 2891 2910 2918 2926 2934 2942 2950 2950 2950 2950 2950 2950 3014 3020 3030 3030	2823 2831 2839 2847 2855 2863 2871 2879 2895 2991 2919 29293 2943 2951 2957 2957 2967 2975 2983 2999 3007 3015 3023 3031 3038	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5050 5050 5050 5100 5110 5120 5130 5150 5170 5200 5220 5220 5220 5220 5230 5220 5230 5330 53	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2652 2664 2672 2880 2704 2712 2720 2728 2738 2744 2752 2780 2788 2788	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2649 2857 2663 2897 2705 2713 2721 2729 2737 2745 2753 2761 2761 2761 2763 2761 2763 2761 2763 2761 2763 2761 2763 2761 2763 2761 2763 2763 2764 2765 2766 2766 2766 2767 2767 2768	2562 2570 2586 2598 2598 2602 2610 2618 2626 2634 2650 2674 2882 2706 2714 2722 2738 2746 2754 2778 2778	2563 2571 2587 2587 2595 2603 2611 2619 2627 2635 2651 2675 2683 2691 2692 2715 2715 2723 2737 2747 2755 2783 2771 2787 2787 2787	2564 2572 2580 2588 2596 2604 2612 2620 2636 2636 2636 2668 2700 2708 2716 2714 2732 2740 2742 2740 2742 2740 2748 2758 2784 2778	2585 2573 2581 2589 2597 2605 2613 2621 2629 2637 2645 2661 2669 2701 2709 2701 2717 2725 2733 2741 2749 2757 2785 27785 27785 2781 2781 2781 2781	2566 2574 2582 2590 2598 2606 2614 2622 2830 2638 2638 2646 2670 2710 2718 2726 2734 2742 2750 2758 2788 2788 2782 2782 2782 2782	2567 2575 2593 2591 2599 2607 2615 2623 2631 2639 2647 2655 2663 2679 2687 2703 2711 2727 2735 2743 2751 2755 2767 2775 2775 27767 27787 2	5410 5420 5430 5440 5450 5460 5510 5520 5530 5540 5550 5610 5620 5630 5640 5650 5680 5680 5680 5680 5680 5680 568	2816 2874 2832 2840 2848 2856 2864 2872 2880 2994 2912 2920 2928 2936 2944 2952 2968 2978 2988 2978 2989 2980 3016 3016 3024 3032 3040	2817 2825 2833 2841 2849 2857 2865 2873 2881 29915 29915 2992 2937 2945 2953 2981 2987 2987 2987 2987 3001 3008 3017 3028 3033 3031 3033	2618 2826 2834 2842 2850 2858 2866 2874 2890 2914 2930 2938 2946 2954 2967 2978 3010 3018 3028 3034 3034	2819 2827 2835 2843 2851 2867 2875 2883 2891 2913 2933 2931 2947 2955 2963 2971 2987 3003 3011 3019 3027 3035 3043	2820 2828 2836 2844 2852 2860 2868 2876 2990 2990 2916 2932 2940 2948 2956 2980 2980 2980 3004 3012 3020 3020 3028 3036 3044	2821 2829 2837 2845 2853 2861 2869 2877 2885 2991 2909 2917 2929 2933 2941 2989 2981 2989 3005 3013 3021 3023 3037 3045	2822 2830 2838 2846 2854 2862 2870 2878 2896 29910 2918 2922 2934 2942 2950 2958 2964 2974 2982 2990 3008 3014 3024 3038 3038 3048	2823 2831 2839 2847 2865 2863 2871 2879 2895 2903 2911 2919 2925 2935 2943 2951 2959 2967 2975 2983 2991 3007 3015 3023 3031 3038 3047	to 5 <b>77</b> 7	3
5010 5020 5030 5040 5050 5060 5070 5100 5110 5120 5140 5140 5170 5220 5220 5220 5220 5220 5230 5230 523	2560 2568 2576 2584 2592 2600 2608 2616 2624 2832 2640 2648 2656 2664 2672 2880 2704 2712 2720 2720 2738 2744 2752 2788 2788 2788 2778	2561 2569 2577 2585 2593 2601 2609 2617 2625 2633 2641 2857 2665 2673 2681 2897 2711 2721 2712 2713 2721 2737 2745 2753 2761 2769 2769 2769 2777	2562 2578 2586 2594 2610 2618 2626 2634 2650 2654 2882 2690 2716 2722 2738 2746 2754 2754 2754 2775 2778	2563 2571 2579 2587 2595 2603 2611 2619 2627 2635 2643 2651 2697 2675 2683 2691 2797 2715 2723 2737 2747 2755 2783 2771 2778	2564 2572 2580 2588 2596 2604 2612 2620 2684 2652 2684 2790 2716 2724 2714 2748 2758 2784 2784 2784 2784 2784 2784 2784 278	2585 2573 2581 2589 2597 2605 2613 2621 2629 2637 2645 2653 2661 2665 2677 2685 2701 2712 2708 2717 2723 2741 2749 2757 2765 2773 2781	2566 2574 2582 2590 2598 2614 2622 2830 2638 2846 2854 2670 2678 2710 2716 2726 2736 2742 2750 2758	2567 2575 2583 2591 2599 2607 2615 2623 2631 2639 2647 2655 2667 2703 2711 2719 2727 2735 2743 2751 2755 2763 2765 2767 2775 2775 2783	5410 5420 5430 5440 5450 5450 5510 5520 5530 5540 5550 5600 5610 5610 5620 5630 5640 5650 5680 5670	2816 2874 2840 2848 2856 2864 2817 2880 2918 2910 2912 2928 2936 2944 2952 2968 2978 2988 2978 2992 3000 3016 3016 3024 3032	2617 2825 2825 2833 2641 2849 2857 2865 2873 2891 2992 2937 2952 2953 2953 2969 2977 2969 2977 2969 2973 3001 3009 3017 3009 3013	2618 2826 2834 2842 2850 2858 2866 2874 2892 2994 2994 2954 2954 2962 2970 2978 2988 2994 3010 3018 3018 3028 3034	2819 2827 2835 2843 2851 2867 2875 2893 2907 2915 2923 2931 2939 2947 2955 2963 2971 2995 3003	2820 2838 2836 2844 2852 2860 2868 2876 2900 2908 2914 2932 2944 2952 2984 2954 2964 2972 2980 2996 3004	2821 2829 2837 2845 2863 2861 2869 2877 2885 2991 2909 2917 2925 2933 2941 2957 2965 2973 2989 2997 3005	2822 2830 2838 2846 2854 2862 2870 2878 2891 2910 2918 2926 2934 2942 2950 2950 2950 2950 2950 2950 3014 3020 3030 3030	2823 2831 2839 2847 2855 2863 2871 2879 2895 2991 2919 29293 2943 2951 2957 2957 2967 2975 2983 2999 3007 3015 3023 3031 3038	to 5 <b>77</b> 7	3

TABLE 1A-2. OCTAL-DECIMAL CONVERSION TABLE (SHEET 4 OF 4)

		0	1	2	3	4	5	6	7		0	1	2	3	4	5	6	7
													0000			0000	2224	2225
6000 3072	6000	3072	3073 3081	3074	3075 3083	3076 3084	3077 3085	30 <b>76</b> 3086	3079 3067	6400 6410	3326 3336	3329 3337	3330 3338	3331 3339	3332 3340	3333 3341	3334 3342	3335 3343
to to	6010 6020	3080 3088	3089	3082 3090	3091	3092	3093	3094	3095	6420	3344	3345	3346	3347	3348	3349	3350	3351
6777 3583	6030	3096	3097	3096	3099	3100	3101	3102	310 <b>3</b>	6430	3352	3353	3354	3355	3356	3357	3356	3359
Octal) (Oecimal)	6040	3104	3105	3106	3107	3106	3109	3110	3111	6440	3360	3361	3362	3363	3364	3365	3366	3367
	6050	3112	3113	3114	3115	3116	3117	3116	3119	6450	3366	3369	3370	3371	3372	3373	3374	3375
	6060	3120	3121	3122	3123	3124	3125	3126	3127	6460	3376	3377	3378	3379	3360	3361	3382	3383
Octal Oecimal	6070	3128	3129	3130	3131	3132	31 <b>3</b> 3	3134	3135	6470	3364	3365	3386	3387	3368	33 <b>69</b>	3390	3391
10000 - 4096												0000	0004	0005	2222	2007	0000	2200
20000 - 6192	8100	3136	3137	3138	3139	3140	3141	3142	3143	6500	3392	3393 3401	3394 3402	3395 3403	3396 3404	3397 3405	3398 3406	3399 3407
30000 - 12266	8110 6120	3144 3152	3145 3153	3146 3154	3147 3155	3148 3156	3149 3157	3150 3158	3151 3159	6510 6520	3400 3406	3409	34UZ 3410	3411	3412	3413	3414	3415
40000 - 16364	6130	3160	3161	3162	3183	3164	3165	3166	3167	6530	3416	3417	3418	3419	3420	3421	3422	3423
50000 - 20480	6140	3168	3169	3170	3171	3172	3173	3174	3175	6540	3424	3425	3426	3427	3428	3429	3430	3431
60000 - 24576	6150	3176	3177	3178	3179	3180	3181	3182	3183	6550	3432	3433	3434	3435	3436	3437	3436	3439
70000 - 28672	6160	3164	3165	3186	3187	3186	3189	3190	3191	6560	3440	3441	3442	3443	3444	3445	3446	3447
	6170	3192	3193	3194	3195	3196	3197	3196	3199	6570	3448	3449	3450	3451	3452	3453	3454	3455
	6200	3200	3201	3202	3203	3204	3205	3 2 0 8	3207	6600	3456	3457	3458	3459	3460	3461	3462	3463
	6210	3208	3209	3210	3211	3212	3213	3214	3215	661	3464	3465	3466	3467	3466	3469	3470	3471
	6220	3216	3217	3218	3219	3220	3221	3222	3223	6620	3472	3473	3474	3475	3476	3477	3478	3479
	6230	3224	3225	3226	3227	3226	3229	3230	3231	6630	3480	3481	3462	3463	3484	3485	3486	3467
	6240	3232	3233	3234	3235	3236	3237	3238	3239	6640	3468	3469	3490	3491	3492	3493	3494	3495
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	6340	3296	3297	3298	3299	3300	3301	3302	3303	6740	3552	3553	3554	3555 3563	3556	3557	3558	3559 3567
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to to 1777 4095	7000 7010 7020 7030 7050 7060 7070 7110 7120 7180 7180 7180 7210 7220 7230 7240 7250 7260 7270	3312 3320 3564 3592 3600 3616 3624 3632 3640 3848 3658 3664 3776 3726 3736 3736 3760 3762 3766 3766	3313 3321 1 3565 3593 3601 3617 3625 3633 3641 3649 3657 3663 3681 3705 3705 3713 3726 3737 3765 3763 37769 37769	3314 3322 2 35686 3594 3602 3618 3624 3650 3658 3686 3686 3706 3714 3722 3730 3738 3746 3754 3762 3770	3315 3323 3567 3595 3803 3611 3627 3635 3643 3651 3658 3867 3675 3771 3773 3773 3773 3775 3763 3771 3775 3773	3316 3324 4 3566 3498 3604 3620 3620 3620 3626 3636 364 3652 3700 3706 3706 3774 3732 3744 3756 3764 3772 3766 3766 3766 3766 3766	3317 3325 5 3568 3497 3605 3637 3621 3623 3637 3645 3885 38701 3708 3717 3725 3725 3733 3741 3748 3757 3765 3773	3318 3326 3590 3598 3604 3614 3622 3630 3636 3636 3636 3670 3710 3712 3712 3726 3734 3742 3750 3758 3768 3774	3318 3327 3581 3599 3607 3615 3638 3638 3667 3667 3695 3703 3713 3714 3715 3727 3745 3757 3767 3776 3776	7400 7400 7410 7420 7430 7440 7450 7500 7510 7520 7530 7540 7550 7680 7680 7680 7680 7680 7680 7680 768	3568 3576 3640 3648 3658 3872 3660 3912 3920 3920 3920 3938 3944 3952 3966 3968 3968 4016 4008 4016 4024	3568 3577 1 3641 3849 3857 3865 3873 3981 3993 3993 3995 3993 3995 3993 3995 3993 4011 4009 4017 4025	3570 3578 2 3642 3650 3858 3868 3874 3869 3914 3823 3938 3938 3938 3938 3938 3948 4040 4010 4010 4016 4024 4034 4042 4040	3571 3578 3 3843 3851 3858 38675 3683 38917 3915 3923 3937 3939 3939 3947 3955 3963 3971 3978 3978 4003 4011 4018 4027 4034 4043 4043 4043	3572 3580 4 3844 3852 3860 3876 3884 3910 3900 3906 3918 3934 3940 3958 3958 4004 4012 4020 4028 4038	3573 3581 5 3845 3853 3861 3863 3877 3885 38917 3925 3937 3949 3957 3968 3997 4005 4013 4021 4024 4024 4045	3574 3562 66 3848 3854 3862 3862 3868 3902 3910 3918 3928 3950 3956 3956 3956 4014 4022 4030 4034 4046 4054	3575 3563 7 3647 3655 3883 3867 3867 3993 3911 3919 3927 3935 3943 3951 3958 3958 3958 3958 3963 4007 4015 4023 4031
to to 1777 4095	7000 7010 7030 7040 7050 7060 7070 7110 7120 7140 7150 7170 7210 7220 7230 7240 7250 7270 7310 7310 7310 7320 7330	3312 3320 3564 3592 3600 3608 3616 3624 3632 3640 3848 3658 3664 3704 3712 3720 3720 3720 3736 3746 3766 3766 3766 3766 3766 3766	3313 3321 1 3565 3593 3601 3663 3633 3641 3649 3657 3673 3683 3673 3681 3721 3728 3753 3753 3753 3763 3763 3763 3763 3763	3314 3322 2 3568 3594 3602 3618 3626 3638 3642 3650 3668 3706 3714 3722 3730 3738 3754 3762 3770 3778 3778 3778 3778 3778	3315 3323 3587 3595 3803 3611 3819 3627 3635 3643 3651 3659 3707 3715 3723 3731 3739 3747 3755 3763 3771 3779 3787 3787 3787 3783 3777 3785 3783 3777 3787 378	3316 3324 4 3568 3496 3691 3620 3628 3636 3636 3636 3636 3706 3716 3724 3732 3736 3766 3766 3768 3768 3768 3768 3768	3317 3325 5 3568 3497 3605 3637 3621 3623 3637 3645 3653 3697 3798 3701 3709 3717 3725 3731 3741 3749 3757 3765 3773 3781 3783 3781 3785 3787 3787 3787 3787 3787 3787 3787	3318 3326 3590 3596 3698 3604 3636 3636 3636 3636 3678 3886 3702 3710 3716 3726 3750 3758 3774 3782 3780 3788	3318 3327 7 3591 3599 3615 3623 3638 3847 3655 3663 3879 3679 3679 3771 3716 3727 3735 3751 3759 3763 3776 3783 3781 3788 3791 3788 3607	740(6 675(6 677(6 741(7 741(7 743(7 745(7 751(7 752(7 753(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 756(7	3568 3576 0 3840 3848 3852 3860 3904 3912 3928 3928 3938 3944 3952 3960 3966 3976 4000 4008 4018 4024 4032 4040 4048 4048 4048	3568 3577 1 3841 3849 3857 3865 3673 3983 3987 3993 3993 4001 4002 4003 4044 4048 4048 4048 4049	3570 3578 2 3842 3850 3858 3858 3868 3874 3892 3994 3930 3936 3936 3936 3936 3948 3954 4010 4012 4014 4015 4015 4015	3571 3578 3 3843 3851 3859 3867 3675 3883 3891 3995 3923 3931 3935 3947 3978 3971 3978 4003 4004 4014 4027 4035 4045 4058	3572 3580 4 3844 3852 3860 3866 3874 3892 3900 3906 3916 3932 3940 3958 3958 3958 4004 4012 4026 4036 4036 4044 4050 4080	3573 3581 5 3845 3653 3869 3877 3885 3893 3601 3917 3925 3933 3641 3949 3957 3965 4013 4024 4024 4024 4045 4045 4061	3574 3562 6 3848 3854 3862 3870 3876 3898 3998 3938 3938 3938 3956 3956 3974 3966 3974 4046 4040 4040 4040 4040 4040 4064 4064	3575 3583 7 3647 3655 3883 3871 3879 3993 3991 3913 3951 3953 3953 3953 395
to to 1777 4095	7000 7010 7020 7030 7040 7050 7060 7070 7110 7120 7130 7140 7150 7150 7210 7220 7230 7240 7250 7270 7310 7320 7320 73320 7340	3312 3320 0 3564 3592 3800 3616 3624 3632 3640 3868 3672 3726 3726 3726 3726 3736 3736 3736	3313 3321 1 3565 3593 3601 3633 3641 3649 3657 3665 3763 37705 3773 37745 3775 37765 37763 37767 37763 37763 37763 3763 3	3314 3322 2 3566 3594 3600 3610 3618 3626 3684 3686 3686 3706 3714 3722 3730 3746 3754 3754 3762 3762 3776 3768 3768 3768 3768 3768 3768 3768	3315 3323 3567 3595 3803 3611 3819 3627 3635 3643 3651 3675 3773 3773 3773 3773 3773 3773 3777 3778 3779 3779	3316 3324 4 3566 3496 3504 3620 3626 3636 3636 3636 3636 3700 3706 3724 3732 3740 3756 3764 3764 3772 3780 3786 3786 3786 3786 3786 3786 3786 3786	3317 3325 5 3568 3497 3605 3613 3621 3623 3637 3645 3685 3883 3709 3717 3725 3733 3748 3757 3765 3763 3763 3763 3763 3763 3763	3318 3326 3590 3596 3614 3622 3630 3648 3654 3670 3702 3710 3716 3728 3750 3750 3750 3768 3768 3768 3768 3768 3768	3318 3327 7 3581 3599 3607 3615 3623 3631 3638 3647 3655 3663 3671 3695 3703 3711 3716 3727 3735 3751 3751 3753 3767 3763 37761 3763 37791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3783 3791 3793 3793 3793 3793 3793 3793 379	7400 6750 6770 7400 7411 7421 7431 7441 7450 7510 7510 7510 7520 7531 7541 7550 7561 7570 7610 7611 7621 7631 7631 7631 7631 7631 7631 7631 763	3568 3576 0 3840 3848 3858 3884 3872 3860 3896 3912 3920 3928 3938 3938 3944 3952 3950 3960 4006 4016 4016 4014 4040 4046 4046 40	3568 3577 1 3841 3849 3857 3865 3865 3863 3897 3913 3921 3945 3953 3953 3953 3953 3953 4001 4008 4007 4025 4033 4041 4049 4049 4049 4049 4065	3570 3578 2 3642 3650 3858 3866 3874 3862 3898 3914 3822 3930 3936 3936 3936 4010 4010 4016 4026 4034 4042 4058 4068	3571 3578 3 3843 3851 3853 3867 3873 3893 3915 3923 3939 3947 3978 3983 3987 3983 4011 4027 4035 4043 4051 4067	3572 3580 4 3844 3852 3660 3876 3892 3900 3906 3916 3932 3940 3944 3956 4004 4012 4028 4020 4036 4044 4052 4088	3573 3581 5 3845 3863 3861 38693 3891 3992 3917 3925 3933 3841 3949 3933 3961 3987 4005 4013 4024 4045 4045 4063 4063 4064 4075	3574 3562 3848 3854 3862 3866 3894 3990 3910 3918 3924 3956 3956 3956 4008 4014 4054 4054 4054 4070	3575 3583 7 3847 3665 3887 3887 3987 39927 39927 39927 3995 3993 3995 39967 39963 3991 39967 4015 4023 4047 4053 4064 4071
to to 1777 4095	7000 7010 7030 7040 7050 7060 7070 7110 7120 7140 7150 7170 7210 7220 7230 7240 7250 7270 7310 7310 7310 7320 7330	3312 3320 3564 3592 3600 3608 3616 3624 3632 3640 3848 3658 3664 3704 3712 3720 3720 3720 3736 3746 3766 3766 3766 3766 3766 3766	3313 3321 1 3565 3593 3601 3663 3633 3641 3649 3657 3673 3683 3673 3681 3721 3728 3753 3753 3753 3763 3763 3763 3763 3763	3314 3322 2 3568 3594 3602 3618 3626 3638 3642 3650 3668 3706 3714 3722 3730 3738 3754 3762 3770 3778 3778 3778 3778 3778	3315 3323 3587 3595 3803 3611 3819 3627 3635 3643 3651 3659 3707 3715 3723 3731 3739 3747 3755 3763 3771 3779 3787 3787 3787 3783 3777 3785 3783 3777 3787 378	3316 3324 4 3568 3496 3691 3620 3628 3636 3636 3636 3636 3706 3716 3724 3732 3736 3766 3766 3768 3768 3768 3768 3768	3317 3325 5 3568 3497 3605 3637 3621 3623 3637 3645 3653 3697 3798 3701 3709 3717 3725 3731 3741 3749 3757 3765 3773 3781 3783 3781 3785 3787 3787 3787 3787 3787 3787 3787	3318 3326 3590 3596 3698 3604 3636 3636 3636 3636 3678 3886 3702 3710 3716 3726 3750 3758 3774 3782 3780 3788	3318 3327 7 3591 3599 3615 3623 3638 3847 3655 3663 3879 3679 3679 3771 3716 3727 3735 3751 3759 3763 3776 3783 3781 3788 3791 3788 3607	740(6 675(6 677(6 741(7 741(7 743(7 745(7 751(7 752(7 753(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 754(7 755(7 756(7	3568 3576 0 3640 3648 3656 3872 3660 3912 3920 3920 3938 3944 3952 3938 3944 3952 3966 4016 4008 4016 4024 4036 4046 4056 4056 4072	3568 3577 1 3841 3849 3857 3865 3673 3983 3987 3993 3993 4001 4002 4003 4044 4048 4048 4048 4049	3570 3578 2 3842 3850 3858 3858 3868 3874 3892 3994 3930 3936 3936 3936 3936 3948 3954 4010 4012 4014 4015 4015 4015	3571 3578 3 3843 3851 3859 3867 3675 3883 3891 3995 3923 3931 3935 3947 3978 3971 3978 4003 4004 4014 4027 4035 4045 4058	3572 3580 4 3844 3852 3860 3866 3874 3892 3900 3906 3916 3932 3940 3958 3958 3958 4004 4012 4026 4036 4036 4044 4050 4080	3573 3581 5 3845 3653 3869 3877 3885 3893 3601 3917 3925 3933 3641 3949 3957 3965 4013 4024 4024 4024 4045 4045 4061	3574 3562 6 3848 3854 3862 3870 3876 3898 3998 3938 3938 3938 3956 3956 3974 3966 3974 4046 4040 4040 4040 4040 4040 4064 4064	3575 3583 7 3647 3655 3883 3871 3879 3993 3991 3913 3951 3953 3953 3953 395

TABLE 1A-3. OCTAL-DECIMAL FRACTION CONVERSION TABLE (SHEET 1 OF 3)

OCTAL	DEC.	OCTAL	DEC.	OCTAL	DEC	OCTAL	DEC.
.000	.000000	.100	.125000	.200	.250000	.300	.375000
.001	.001953	.101	126953	201	.251953	.301	376953
.002	.003906	102	.128906	202	.253906	302	
.003	.005859						.378906
		.103	130859	.203	255859	.303	.380859
.004	007812	.104	.132812	.204	257812	.304	.382812
.005	.009765	.105	.134765	.205	.259765	305	.384765
.006	.011718	.106	.136718	.206	261718	.306	.386718
.007	.013671	.107	138671	.207	253671	307	
				.207	.293671	.307	.388671
.010	.015625	110	140625	.210	.265625	.310	.390625
.011	.017578	.111	.142578	.211	.267578	.311	.392578
.012	.019531	.112	.144531	.212	.269531	.312	394531
.013	.021484	.113	146484	.213	.271484.	.313	396484
.014	.023437	.114	148437	.214	273437	314	398437
015	025390	.115	150390				
.016				.215	275390	.315	400390
	.027343	.116	.152343	.216	277343	.316	.402343
.017	.029295	.117	.154296	.217	.279296	.317	.404296
.020	.031250	.120	.156250	.220	.281250	220	406350
.021	033203	.121	.158203			.320	.406250
.022				.221	.283203	.321	.408203
	.035156	.122	150156	.222	.285156	.322	.410156
.023	.037109	.123	.152109	.223	.287109	.323	412109
.024	.039062	.124	164062	.224	289062	.324	414062
.025	.041015	125	.165015	.225	.291015		
.026	042968	126				.325	416015
.027			187968	.226	292968	.326	417968
.02/	.044921	.127	.169921	.227	.294921	.327	.419921
.030	.045875	.130	.171875	.230	.296875	.330	.421875
.031	.048828	.131	173828	.231	298828	.331	
.032	.050781	132					423828
.033	.052734		.175781	232	.300781	.332	.425781
		.133	.177734	233	.302734	.333	.427734
.034	.054587	.134	.179687	.234	.304687	.334	429887
.035	.058540	.135	.181640	.235	.305540	.335	431640
.036	.058593	.135	183593	.236	308593	.338	433593
.037	080548	.137	185646	.237	310548	.337	435546
.040	063500	4.45					
.040	.062500 .08445 <b>3</b>	.140	187 <b>50</b> 0	.240	.312500	.340	437500
		141	189 <b>453</b>	.241	314453	.341	.439453
.042	068408	.142	.19 <b>1406</b>	.242	.318408	.342	441408
.043	.088359	.143	193359	.243	318359	.343	443359
.044	.070312	.144	195312	.244	.320312	344	445312
.045	072285	145	.197285	245			
.046	.074218				322285	.345	447285
		.148	.199218	.248	.324218	.346	.449218
.047	.078171	.147	.201171	.247	.328171	.347	.451171
.050	.078125	.150	.203125	.250	.328125	.360	.453125
.051	080078	.151	205078	.251	.330078		
052	082031					.351	455078
		.152	.207031	.252	.332031	352	.457031
.053	.083984	.153	208984	.253	333984	.353	458984
.054	.086937	.154	.210937	254	.335937	.354	460937
.055	.087890	.155	.212890	.255	337890	.355	482890
.058	.089843	.158	.214843	255	.339843	.356	454843
.057	.091798	.157	.216795	.257	.339843	.357	.488795
						.337	.700780
.080	.093750	.160	218750	.280	.343750	.350	.488750
.081	.095703	.161	.220703	.281	.345703	.361	470703
.082	.097856	.182	.222656	.262	.347658	362	472858
.083	099609	.183	224809	.263	349809	383	474809
.064	101582	164	228682				
.065	101552			284	.351582	.364	476562
		.165	228515	265	.353515	.385	478515
.066	105488	.188	230488	288	.366488	.366	.480468
.067	.107421	.187	.232421	287	.357421	387	482421
.070	.109375	170	.234375	270	250275		
.071		170		270	.359375	.370	484376
	.111328	.171	236328	.271	.381328	.371	488328
.072	.113281	.172	238281	.272	.383281	.372	.488281
.073	.115234	.173	240234	.273	385234	373	490234
074	.117187	.174	242187	274	.387187	374	
075	119140	175					492187
.076			.244140	275	.389140	.375	494140
.07.0	.121093`	.178	.248093	278	.371093	.376	498093
.077	.123048	.177	248046	277	.373048	.377	

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TABLE 1A-3. OCTAL-DECIMAL FRACTION CONVERSION TABLE (SHEET 2 OF 3)

OCTAL   DEC			· · · · · · · · · · · · · · · · · · ·		
0.00401   0.00980   0.00501   0.01224   0.00601   0.01485   0.00701   0.01716     0.00402   0.00981   0.00503   0.01232   0.00603   0.01476   0.00703   0.01724     0.00404   0.00891   0.00503   0.01232   0.00603   0.01476   0.00703   0.01724     0.00405   0.00981   0.00505   0.01239   0.00605   0.01487   0.00705   0.01724     0.00406   0.00895   0.00505   0.01239   0.00606   0.01487   0.00705   0.01724     0.00406   0.00896   0.00505   0.01239   0.00606   0.01487   0.00705   0.01723     0.00407   0.01007   0.00510   0.01251   0.00607   0.01487   0.00705   0.01723     0.00410   0.01007   0.00510   0.01251   0.00610   0.01485   0.00707   0.01739     0.00411   0.01010   0.00511   0.01255   0.00611   0.01495   0.00707   0.01739     0.00411   0.01010   0.00511   0.01255   0.00611   0.01899   0.00711   0.01747     0.00414   0.01022   0.00514   0.01266   0.00614   0.0150   0.00714     0.00414   0.01022   0.00518   0.01274   0.00616   0.01510   0.00714   0.00714     0.00416   0.01025   0.00516   0.01274   0.00616   0.01518   0.00716   0.01758     0.00416   0.01025   0.00516   0.01274   0.00616   0.01518   0.00716   0.01759     0.00417   0.01031   0.00520   0.01281   0.00620   0.01525   0.00710   0.01759     0.00420   0.01037   0.00520   0.01281   0.00620   0.01525   0.00720   0.01770     0.00421   0.01041   0.00521   0.01288   0.00622   0.01533   0.00722   0.01770     0.00421   0.01041   0.00521   0.01288   0.00622   0.01533   0.00722   0.01770     0.00422   0.01045   0.00525   0.01288   0.00624   0.01541   0.00724   0.01773     0.00423   0.01089   0.00523   0.01288   0.00624   0.01544   0.00724   0.01773     0.00424   0.01087   0.00525   0.01304   0.00626   0.01544   0.00725   0.01780     0.00424   0.01089   0.00525   0.01304   0.00626   0.01544   0.00725   0.01780     0.00425   0.01089   0.00525   0.01304   0.00626   0.01544   0.00725   0.01781     0.00426   0.01089   0.00527   0.01304   0.00626   0.01544   0.00725   0.01780     0.00427   0.01089   0.00528   0.01304   0.00626   0.01544   0.00725   0.01781     0.004	OCTAL	DEC.	OCTAL DEC.	OCTAL DEC.	OCTAL DEC.
0.00401   0.00980   0.00501   0.01224   0.00601   0.01485   0.00701   0.01716     0.00402   0.00981   0.00503   0.01232   0.00603   0.01476   0.00703   0.01724     0.00404   0.00891   0.00503   0.01232   0.00603   0.01476   0.00703   0.01724     0.00405   0.00981   0.00505   0.01239   0.00605   0.01487   0.00705   0.01724     0.00406   0.00895   0.00505   0.01239   0.00606   0.01487   0.00705   0.01724     0.00406   0.00896   0.00505   0.01239   0.00606   0.01487   0.00705   0.01723     0.00407   0.01007   0.00510   0.01251   0.00607   0.01487   0.00705   0.01723     0.00410   0.01007   0.00510   0.01251   0.00610   0.01485   0.00707   0.01739     0.00411   0.01010   0.00511   0.01255   0.00611   0.01495   0.00707   0.01739     0.00411   0.01010   0.00511   0.01255   0.00611   0.01899   0.00711   0.01747     0.00414   0.01022   0.00514   0.01266   0.00614   0.0150   0.00714     0.00414   0.01022   0.00518   0.01274   0.00616   0.01510   0.00714   0.00714     0.00416   0.01025   0.00516   0.01274   0.00616   0.01518   0.00716   0.01758     0.00416   0.01025   0.00516   0.01274   0.00616   0.01518   0.00716   0.01759     0.00417   0.01031   0.00520   0.01281   0.00620   0.01525   0.00710   0.01759     0.00420   0.01037   0.00520   0.01281   0.00620   0.01525   0.00720   0.01770     0.00421   0.01041   0.00521   0.01288   0.00622   0.01533   0.00722   0.01770     0.00421   0.01041   0.00521   0.01288   0.00622   0.01533   0.00722   0.01770     0.00422   0.01045   0.00525   0.01288   0.00624   0.01541   0.00724   0.01773     0.00423   0.01089   0.00523   0.01288   0.00624   0.01544   0.00724   0.01773     0.00424   0.01087   0.00525   0.01304   0.00626   0.01544   0.00725   0.01780     0.00424   0.01089   0.00525   0.01304   0.00626   0.01544   0.00725   0.01780     0.00425   0.01089   0.00525   0.01304   0.00626   0.01544   0.00725   0.01781     0.00426   0.01089   0.00527   0.01304   0.00626   0.01544   0.00725   0.01780     0.00427   0.01089   0.00528   0.01304   0.00626   0.01544   0.00725   0.01781     0.004	.000400	.000975	000500 001220	000600 001454	000700 001708
000402   000984					
000403					
000404	i			=	
000405 000995 000506 01243 000606 01487 000706 001728 000407 001003 000506 01247 000607 001487 000706 001731 000407 001003 000507 001247 000607 001487 000706 001735 000410 001007 001010 000510 001255 000610 001489 000710 001735 000411 001010 000512 001255 000611 001489 000712 001743 000412 001014 000512 001258 000611 001489 000712 001743 000412 001018 000513 001262 000613 001506 000712 001740 000413 001026 000513 001262 000613 001506 000714 001756 000414 001022 000515 001270 000615 001502 000714 001756 000414 001022 000515 001270 000615 001502 000714 001756 000414 001023 000516 001270 000615 001502 000716 001769 000414 001023 000517 001277 000615 001502 000716 001769 000414 001023 000517 001277 000617 001522 0000716 001760 000412 001023 000517 001277 000615 001502 000716 001760 000421 001023 000517 001277 000617 001525 0007070 001760 000421 001041 000521 001285 000622 001525 0007072 001773 000422 001043 000523 001283 000623 001533 000722 001773 000423 001049 000523 001283 000622 001533 000722 001773 000423 001049 000523 001283 000622 001533 000722 001781 000424 001052 001052 000525 0016052 001					
0000406					
000407					
000411					
000411	.000410	.001007	.000510 .001251	.000610 .001495	.000710 .001739
0000413	.000411	.001010	.000511 .001255	.000611 .001499	
0.00414	.000412	.001014		.000612 .001502	.000712 .001747
000415	.000413	.001018	.000513 .001262	.000613 .001506	.000713 .001750
O00416					
000427					
0.00420					
000421	.000417	.00103 <b>3</b>	.000517 .001277	.000617 .001522	.000717 .001766
000422					
000423					
000424					
DO0425					
000426         001060         000526         001304         000627         001582         000726         001796           000430         001069         000530         001312         000630         001556         000730         001800           000431         001071         000531         001316         000631         001560         000731         001800           000432         001075         000532         001319         000632         001564         000732         001808           000433         001079         000533         001327         000633         001571         000734         001808           000435         001083         000534         001327         000634         001571         000734         001815           000435         001087         000536         001331         000635         001575         000735         001819           000436         001091         000536         001335         000637         001583         000737         001823           000441         001098         000540         001342         000641         001589         000740         001823           000441         001098         000540         001349         000641         0015					
000427         001664         000527         001308         000627         001552         000730         001796           000431         .001071         .000531         .001316         .000631         .001560         .000731         .001800           .00432         .001075         .000532         .001319         .000633         .001667         .000732         .001804           .00433         .001079         .000533         .001327         .000633         .001567         .000732         .001811           .00435         .001087         .000534         .001327         .000635         .001575         .000734         .001819           .000436         .001087         .000536         .001335         .000635         .001575         .000736         .001819           .000437         .001094         .000536         .001335         .000638         .001579         .000736         .001823           .000440         .001098         .000540         .001342         .000640         .001589         .000740         .001831           .000441         .001102         .000541         .001349         .000641         .001589         .000741         .001836           .000441         .001108         .000542					
000430         .001069         .000530         .001312         .000630         .001556         .000730         .001800           .000431         .001075         .000531         .001316         .000631         .001564         .000732         .01808           .000432         .001075         .000533         .001323         .000633         .001564         .000733         .001816           .000434         .001083         .000534         .001327         .000634         .001571         .000734         .001815           .000435         .001087         .000535         .001331         .000635         .001575         .000735         .001819           .000436         .001091         .000536         .001335         .000635         .001575         .000736         .001823           .000437         .001094         .000540         .001349         .000637         .001580         .000737         .001823           .000441         .001088         .000540         .001349         .000641         .001580         .000740         .001831           .000442         .001102         .000541         .001350         .000841         .001580         .000741         .001831           .000443         .001103         .000					
000431         001071         000531         001316         000632         001564         000732         001804           000432         001075         000532         001319         000632         001564         000732         001801           000433         001079         000533         001327         000634         001571         000734         001811           000435         001087         000535         001331         000635         001575         000735         001819           000436         001091         000536         001335         000636         001579         000736         001823           000440         001094         000537         001339         000837         001583         000737         001823           000441         001108         000540         001342         000640         001599         000740         001931           000441         001102         000641         001348         000641         001590         000741         001931           000443         001101         000642         001350         00942         001594         000742         001836           000445         001113         000547         001358         0004594         0017	.000427	.001064	.000527 .001308	.000627 .001552	
000432         001075         000532         .001319         .000632         .001567         .000732         .001808           000434         .001083         .000534         .001327         .000634         .001575         .000733         .001815           .000435         .001087         .000535         .001335         .000636         .001575         .000735         .001815           .000436         .001091         .000537         .001335         .000637         .001579         .000736         .001823           .000437         .001094         .000540         .001342         .000637         .001583         .000740         .001823           .000441         .001102         .000541         .001349         .000641         .001590         .000740         .001831           .000441         .001102         .000542         .001350         .000841         .001590         .000741         .001838           .000443         .001111         .000542         .001351         .000943         .001598         .000742         .001838           .000444         .001113         .000544         .001351         .000943         .001598         .000742         .001861           .000445         .001117         .00056					
000433         001079         .000633         .001323         .000634         .001671         .000734         .001815           .000435         .001087         .000634         .001327         .00634         .001575         .000735         .001815           .000436         .001091         .000635         .001335         .000637         .001823         .000735         .001823           .000447         .001094         .000537         .001338         .000637         .001583         .000737         .001823           .000440         .001098         .000540         .001342         .000640         .001589         .000740         .001831           .000441         .001102         .000641         .001599         .000741         .001831           .000442         .001108         .000542         .001350         .000842         .001594         .000742         .001838           .000443         .001110         .000643         .001356         .000844         .001602         .000744         .001848           .000445         .001117         .000546         .001351         .000845         .001802         .000744         .001848           .000445         .001121         .000546         .001365         .0004					
DO0434					
DO0435					
DOD0436	1				
.000437         .001094         .000537         .001339         .000637         .001583         .000737         .001927           .000440         .001098         .000540         .001349         .000640         .001599         .000740         .001831           .000441         .001108         .000542         .001350         .000842         .001594         .000742         .001838           .000443         .001110         .000543         .001354         .000844         .001692         .000743         .001358           .000444         .001113         .000544         .001358         .000844         .001602         .000744         .001948           .000445         .001117         .000545         .001351         .000844         .001602         .000743         .001948           .000449         .001121         .000546         .001381         .000845         .001805         .000745         .001950           .000450         .001122         .000550         .001377         .000647         .001951         .000751         .001957           .000451         .001132         .000551         .001377         .000851         .00197         .000751         .001961           .000452         .001132         .00					
000441					
.000442         .001108         .000542         .001354         .000943         .001593         .000742         .001343           .000443         .001110         .000644         .001358         .000843         .001602         .000744         .001942           .000445         .001117         .000546         .001351         .000845         .001805         .000745         .001950           .000449         .001121         .000546         .001385         .000647         .001809         .000749         .001853           .000447         .001125         .000554         .001389         .000647         .001809         .000749         .001853           .000450         .001132         .000552         .001377         .000851         .001921         .000750         .001957           .000451         .001132         .000551         .001377         .000851         .001825         .000752         .001896           .000453         .001140         .000552         .001380         .000953         .001825         .001853           .000454         .001144         .000554         .001388         .000864         .001829         .000755         .001878           .000455         .001140         .000556         .0					
.000443         .001110         .000543         .001354         .000843         .001598         .000743         .001948           .000444         .001117         .000544         .001358         .000844         .001805         .000744         .001950           .000449         .001121         .000546         .001365         .000546         .001809         .000749         .001853           .000447         .001125         .000547         .001389         .000647         .001813         .000749         .001853           .000450         .001132         .000550         .001373         .000851         .001917         .000750         .001957           .000451         .001132         .000551         .001377         .000851         .001921         .000751         .001955           .000452         .001139         .000552         .001390         .000852         .001825         .001825         .001825         .001823           .000454         .001144         .000554         .001388         .000852         .001825         .000752         .001873           .000455         .001149         .000555         .001398         .000856         .001832         .000756         .001873           .000455         .0					
.000444         .001113         .000544         .001358         .000844         .001602         .00744         .001950           .000449         .001121         .000545         .001351         .000646         .001805         .000749         .001853           .000447         .001125         .000547         .001399         .000647         .001513         .000747         .001853           .000450         .001132         .000550         .001373         .000851         .001921         .000751         .001957           .000451         .001132         .000551         .001377         .000851         .001921         .000751         .001889           .000452         .001139         .000552         .001384         .000852         .001825         .001825         .001889           .000453         .001140         .000553         .001384         .000953         .001929         .000754         .001873           .000454         .001144         .000554         .001388         .000954         .001829         .000754         .001873           .000455         .001149         .000555         .001388         .000954         .001938         .000754         .001889           .000459         .001152         .00					
.000445         .001117         .000546         .001365         .000945         .001805         .000745         .001850           .000447         .001121         .000546         .001365         .000647         .001809         .000747         .001853           .000447         .001125         .000547         .001399         .000647         .001813         .000747         .001951           .000450         .001132         .000551         .001377         .000851         .001921         .000751         .001951           .000452         .001139         .000552         .001390         .000952         .001825         .001889           .000453         .001140         .000553         .001384         .000953         .001829         .000752         .001889           .000454         .001144         .000554         .001388         .000954         .001832         .000754         .001873           .000455         .001149         .000556         .001392         .00855         .001838         .000754         .001873           .000459         .001155         .000556         .001398         .000856         .001840         .000755         .001884           .000490         .001158         .000596         .00					
.000449					
.000447 .001125 .000547 .001399 .000647 .001513 .000747 .001957 .000450 .001129 .000550 .001373 .000850 .001917 .000750 .001961 .000451 .001132 .000551 .001377 .000851 .001921 .000755 .001855 .000452 .001139 .000552 .001380 .000853 .001925 .000752 .001889 .000453 .001140 .000553 .001384 .000953 .001929 .000752 .001889 .000454 .001144 .000554 .001388 .000854 .001832 .000754 .001878 .000455 .001149 .000555 .001392 .000855 .001938 .000755 .001880 .000455 .001149 .000555 .001392 .000855 .001840 .000755 .001880 .000457 .001155 .000557 .001399 .000857 .001844 .000757 .001888 .000457 .001155 .000557 .001399 .000857 .001844 .000757 .001888 .000480 .001158 .000557 .001399 .000857 .001844 .000757 .001888 .000480 .001158 .000580 .001407 .000891 .001844 .000757 .001888 .000480 .001167 .000582 .001411 .000892 .001855 .000792 .001899 .000482 .001167 .000582 .001411 .000992 .001855 .000792 .001899 .000484 .001174 .000584 .001418 .000992 .001855 .000792 .001899 .000484 .001174 .000584 .001418 .000993 .001858 .000793 .001803 .001958 .000794 .001807 .000485 .001179 .000595 .001422 .000885 .001897 .000795 .001811 .000486 .001179 .000595 .001422 .000895 .001897 .000795 .001811 .000487 .001189 .000596 .001422 .000896 .001870 .000795 .001814 .000487 .001189 .000596 .001428 .000698 .001870 .000795 .001814 .000487 .001189 .000570 .001439 .000870 .001878 .000770 .001922 .000471 .001194 .000571 .001439 .000870 .001888 .000770 .001922 .000471 .001194 .000571 .001439 .000870 .001888 .000772 .001930 .000472 .001187 .000573 .001445 .000873 .001997 .001888 .000772 .001930 .000474 .001205 .000574 .001449 .000575 .001453 .000875 .001997 .000775 .001945 .000478 .001201 .000579 .001457 .000876 .001701 .000775 .001945					
.000451         .001132         .000551         .001377         .000851         .001921         .000751         .001955           .000452         .001139         .000552         .001390         .000953         .001929         .000752         .001889           .000453         .001140         .000564         .001388         .000953         .001929         .000753         .001873           .000454         .001149         .000565         .001392         .000855         .001938         .000754         .001880           .000459         .001152         .000566         .001398         .000856         .001840         .000755         .001880           .000490         .001155         .000557         .001399         .000857         .001844         .000757         .001884           .000491         .001158         .000590         .001403         .000890         .001847         .000780         .001892           .000492         .001167         .001691         .001407         .000991         .001851         .000791         .001892           .000493         .001167         .000582         .001411         .000992         .001855         .000792         .001899           .000493         .001174         .0					
.000451         .001132         .000551         .001377         .000851         .001921         .000751         .001955           .000452         .001139         .000552         .001390         .000953         .001929         .000752         .001889           .000453         .001140         .000564         .001388         .000953         .001929         .000753         .001873           .000454         .001149         .000565         .001392         .000855         .001938         .000754         .001880           .000459         .001152         .000566         .001398         .000856         .001840         .000755         .001880           .000490         .001155         .000557         .001399         .000857         .001844         .000757         .001884           .000491         .001158         .000590         .001403         .000890         .001847         .000780         .001892           .000492         .001167         .001691         .001407         .000991         .001851         .000791         .001892           .000493         .001167         .000582         .001411         .000992         .001855         .000792         .001899           .000493         .001174         .0	000450	001129	000550 001373	000950 001917	000750 001961
.000452         .001139         .000552         .001390         .000952         .001825         .000752         .001889           .000453         .001140         .000553         .001384         .000953         .001929         .000753         .001873           .000454         .001144         .000554         .001388         .000954         .001832         .000754         .001878           .000455         .001149         .000556         .001392         .000856         .001938         .000755         .001880           .000457         .001152         .000556         .001398         .000856         .001840         .000757         .001884           .000490         .001158         .000590         .001403         .000857         .001844         .000757         .001888           .000491         .001183         .000590         .001847         .000780         .001892           .000492         .001167         .000581         .001407         .000991         .001851         .000791         .001892           .000493         .001171         .000582         .001415         .000992         .001855         .000792         .001899           .000493         .001179         .000583         .001415         .0					
.000453         .001140         .000553         .001384         .000953         .001929         .000753         .001873           .000454         .001144         .000554         .001388         .000954         .001832         .000754         .001878           .000455         .001149         .000556         .001392         .000856         .001880         .000755         .001880           .000459         .001155         .000557         .001398         .000856         .001840         .000756         .001884           .000490         .001155         .000590         .001403         .000990         .001847         .000780         .001892           .000491         .001183         .000591         .001407         .000991         .001851         .000791         .001892           .000482         .001167         .000582         .001411         .000992         .001855         .000792         .001899           .000484         .001174         .000583         .001415         .000993         .001958         .000793         .001903           .000485         .001179         .000596         .001422         .00985         .001997         .00795         .001811           .000465         .001199         .000					
.000454         .001144         .000554         .001388         .000954         .001832         .000754         .001878           .000455         .001149         .000555         .001392         .000855         .001938         .000755         .001880           .000457         .001155         .000557         .001398         .000856         .001840         .000756         .001884           .000480         .001155         .000557         .001399         .000857         .001844         .000757         .001888           .000491         .001183         .000591         .001407         .000991         .001851         .000791         .001892           .000482         .001167         .000582         .001411         .000991         .001855         .000792         .001899           .000483         .00171         .000582         .001415         .000993         .001958         .000792         .001899           .000484         .001174         .000594         .001419         .000993         .001958         .000793         .001903           .000465         .001179         .000596         .001422         .000898         .001870         .000794         .001907           .000470         .001189         .00					
.000455		_			
.000459         .001152         .000556         .001398         .000856         .001840         .000758         .001884           .000457         .001155         .000557         .001399         .000857         .001844         .000757         .001888           .000490         .001158         .000590         .001403         .000890         .001847         .000780         .001892           .000491         .001167         .000591         .001407         .000991         .001851         .000791         .001895           .000493         .001171         .000582         .001415         .000992         .001855         .000792         .001899           .000484         .001174         .000594         .001415         .000994         .001883         .000794         .001903           .000485         .001179         .000596         .001422         .009885         .001897         .000795         .001811           .000486         .001192         .000596         .001428         .000698         .001870         .001814           .000470         .001189         .000570         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .000571         .0					
.000457         .001155         .000557         .001399         .000857         .001844         .000757         .001888           .000480         .001158         .000590         .001403         .000990         .001847         .000780         .001892           .000481         .001183         .000591         .001407         .000991         .001851         .000791         .001985           .000482         .001167         .000582         .001411         .000992         .001855         .000792         .001899           .000484         .001171         .000583         .001415         .000993         .001958         .000793         .001903           .000485         .001174         .000594         .001419         .000984         .001883         .000794         .001907           .000465         .001179         .00596         .001422         .000885         .001870         .000795         .001811           .000487         .001189         .000596         .001428         .000698         .001870         .000798         .001814           .000470         .001189         .000571         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .00					
0.00491	.000457				
0.00491	.000490	.001158	.000590 .001403	.000990 .001847	.000780 .001892
.000482 .001167					
.000493         .001171         .000583         .001415         .000993         .001958         .000793         .001903           .000484         .001174         .000594         .001419         .000994         .001883         .000794         .001907           .000465         .001179         .000596         .001422         .000598         .001870         .000795         .001811           .000487         .001189         .000597         .001434         .000987         .001874         .000797         .001919           .000470         .001190         .000570         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .000571         .001439         .000971         .001882         .000771         .001929           .000472         .001187         .000572         .001441         .000972         .001888         .000772         .001930           .000473         .001201         .000573         .001445         .000873         .001888         .000773         .001934           .000474         .001205         .000574         .001449         .000974         .001893         .000775         .001937           .000475         .001209         .0			.000582 .001411	.000992 .001855	.000792 .001899
.000484         .001174         .000594         .001419         .000994         .001883         .000794         .001907           .000465         .001179         .000596         .001422         .00085         .001897         .000795         .001811           .000487         .001189         .000596         .001428         .000698         .001870         .000798         .001814           .000470         .001190         .000570         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .000571         .001439         .000971         .001882         .000771         .001929           .000472         .001187         .000572         .001441         .000972         .001888         .000772         .001930           .000473         .001201         .000573         .001445         .000873         .001899         .000773         .001934           .000474         .001205         .001449         .000974         .001893         .000775         .001937           .000475         .001209         .00575         .001453         .000975         .001997         .001997         .000775         .001937           .000475         .001209         .005					
.000465         .001179         .00059E         .001422         .000985         .001997         .000795         .001811           .000468         .001192         .000596         .001428         .000698         .001870         .000798         .001814           .000470         .001190         .000570         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .000571         .001439         .000971         .001982         .000771         .001929           .000472         .001187         .000572         .001441         .000972         .001888         .000772         .001930           .000473         .001201         .000573         .001445         .000873         .001999         .000773         .001934           .000474         .001205         .000574         .001449         .000974         .001893         .000774         .001937           .000475         .001209         .000575         .001453         .000975         .001997         .000775         .001941           .000478         .001213         .000579         .001457         .000876         .001701         .000778         .001945			.000594 .001419		
.000487         .001189         .000587         .001430         .000987         .001874         .000797         .001919           .000470         .001190         .000570         .001434         .000870         .001878         .000770         .001922           .000471         .001194         .000571         .001439         .000971         .001982         .000771         .001929           .000472         .001187         .000572         .001441         .000972         .001888         .000772         .001930           .000473         .001201         .000573         .001445         .000873         .001899         .000773         .001934           .000474         .001205         .001449         .000974         .001893         .000774         .001937           .000475         .001209         .000575         .001453         .000975         .001997         .000775         .001941           .000478         .001213         .000579         .001457         .000876         .001701         .000778         .001945			000595 001422	.000985 .001997	
.000470 .001190 .000570 .001434 .000870 .001878 .000770 .001922 .000471 .001194 .000571 .001439 .000971 .001882 .000771 .001929 .000472 .001187 .000572 .001441 .000972 .001888 .000772 .001930 .000473 .001201 .000573 .001445 .000873 .001899 .000773 .001934 .000474 .001205 .000574 .001449 .000873 .001893 .000774 .001937 .000475 .001209 .000575 .001449 .000975 .001893 .000775 .001941 .000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945		-			
.000471         .001194         .000571         .001439         .000971         .001982         .000771         .001929           .000472         .001187         .000572         .001441         .000972         .001888         .000772         .001930           .000473         .001201         .000573         .001445         .000873         .001898         .000773         .001934           .000474         .001205         .000574         .001449         .000974         .001893         .000774         .001937           .000475         .001209         .000575         .001453         .000975         .001997         .000775         .001941           .000478         .001213         .000579         .001457         .000876         .001701         .000778         .001945	.000487	.001189	000587 001430	.000987 .001874	.000797 .001919
.000472 .001187 .000572 .001441 .000972 .001888 .000772 .001930 .000473 .001201 .000573 .001445 .000873 .001899 .000773 .001934 .000474 .001205 .000574 .001449 .000974 .001893 .000774 .001937 .000475 .001209 .000575 .001453 .000975 .001897 .000775 .001941 .000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945					
.000473 .001201 .000573 .001445 .000873 .001999 .000773 .001934 .000474 .001205 .000574 .001449 .000974 .001893 .000774 .001937 .000475 .001209 .000575 .001453 .000975 .001997 .000775 .001941 .000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945					
.000474 .001205 .000574 .001449 .000974 .001893 .000774 .001937 .000475 .001209 .000575 .001453 .000975 .001997 .000775 .001941 .000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945					
.000475 .001209 .000575 .001453 .000975 .001997 .000775 .001941 .000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945					
.000478 .001213 .000579 .001457 .000876 .001701 .000778 .001945					
.000949   .0007/7   .001949   .001949   .001949					
	.000477	.001218	.000877 .001481	.0008// .001/08 /	.000777 .001949

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TABLE 1A-3. OCTAL-DECIMAL FRACTION CONVERSION TABLE (SHEET 3 OF 3)

OCTAL	DEC.	OCTAL	DEC.	OCTAL	DEC.	OCTAL	DEC.
.000000	.000000	.000100	.000244	.000200	.000488	.000300	000722
.000001	.000003	.000101	.000247	.000201	.000488	.000300	.000732
.000002	.000007	.000102	.000251	.000201	.000495	.000301	.000736
.000003	.000011	.000103	.000255	.000202	.000499		.000740
.000004	.000015	000104	.000259	.000203		.000303	.000743
.000005	.000019	.000105	.000253		.000503	.000304	.000747
.000006	.000022	.000106	.000263	.000205	.000507	.000305	.000751
.000007	.000022			.000206	.000511	.000306	.000755
		.000107	.000270	.000207	.000514	.000307	.000759
.000010	.000030	.000110	000274	.000210	.000518	.000310	.000762
.000011	000034	.000111	.000278	.000211	.000522	.000311	.000766
.000012	.000038	.000112	.000282	.000212	.000526	.000312	.000770
.000013	.000041	.000113	.000286	.000213	.000530	.000313	.000774
.000014	.000045	.000114	.000289	.000214	.000534	.000314	.000778
.000015	.000049	.000115	.000293	.000215	.000537	.000315	000782
.000016	.000053	.000116	.000297	.000216	.000541	.000316	.000785
.000017	.000057	.000117	.000301	.000217	.000545	.000317	.000789
.000020	.000061	.000120	.000305	.000220	.000549	000000	000700
.000021	.000064	.000120				.000320	.000793
.000021	000068		.000308	.000221	000553	.000321	000797
		.000122	.000312	.000222	.000556	.000322	.000801
.000023	.000072	.000123	.000316	.000223	.000560	.000323	.000805
.000024	.000076	.000124	.000320	.000224	.000564	.000324	.000808
.000025	.000080	.000125	.000324	.000225	.000568	.000325	.000812
.000026	.000083	.000126	.000328	000226	.000572	.000326	.000816
.000027	.000087	.000127	.000331	.000227	.000576	.000327	.000820
.000030	.000091	.000130	.000335	.000230	.000579	.000330	.000823
.000031	.000095	000131	.000339	.000231	.000583	.000330	.000823
.000032	.000099	.000132	.000343	.000231	.000587		
.000033	.000102	.000132	.000343			.000332	.000831
.000034	.000102			.000233	.000591	.000333	.000835
		.000134	.000350	.000234	.000595	.000334	.000839
.000035	.000110	.000135	.000354	.000235	.000598	.000335	.000843
.000036	.000114	.000136	.000358	.000236	.000602	.000336	.000846
.000037	.000118	.000137	.000362	.000237	.000606	.000337	.000850
.000040	.000122	.000140	.000368	.000240	.000610	.000340	.000854
.000041	.000125	.000141	.000370	.000241	.000814	.000341	.000858
.000042	.000129	.000142	.000373	.000242	.000817	.000342	.000862
.000043	.000133	.000143	.000377	.000243	.000521	.000342	
.000044	.000137	.000144	.000381	.000244			.000865
.000045	.000141	.000145			.000525	.000344	.000869
.000048	.000141		.000385	.000245	.000829	000345	.000873
.000048	.000144	.000146	.000389 .000392	.000246	.000633 .000637	.000346	.000877
		1		.000247	.000637	.000347	.000881
.000050 .000051	.000152 .000156	.000150	.000396	.000250	.000640	.000350	.000885
		.000151	.000400	.000251	.000644	.000351	.000888
.000052	.000160	.000152	.000404	.000252	.000648	.000352	.000892
.000053	.000184	.000153	.000408	.000253	.000652	.000363	.000898
.000054	.000187	.000154	.000411	.000254	.000856	.000354	.000900
.000055	.000171	.000155	.000415	.000255	.000659	.000355	.000904
.000058	.000175	.000156	.000419	.000258	.000663	.000356	.000907
.000057	.000179	.000157	.000423	.000257	.000667	.000357	.000911
.000050	.000183	.000160	.000427	000380	000074		
.000061	.000188	.000160	.000427	.000260	.000671	.000360	.000915
.000062	.000188			.000261	.000675	.000381	.000919
.000062	.000190	.000162	.000434	.000262	.000679	000362	.000923
		.000183	.000438	.000263	.000882	.000363	.000926
.000064	.000198	.000184	.000442	.000284	.000686	.000364	.000930
.000055	.000202	.000165	.000446	.000285	.000690	.000365	.000934
.000056	.000205	.000168	.000450	.000288	.000694	.000386	.000938
.000067	.000209	.000167	.000453	.000287	.000698	.000387	.000942
.000070	.000213	.000170	.000457	.000270	.000701	.000370	000040
.000071	.000217	000171	.000461	.000270	.000701		000946
.000072	00021	.000171	.000465			.000371	.000949
.000072	.000221			.000272	.000709	.000372	000953
		.000173	.000489	.000273	.000713	000373	.000957
.000074	.000228	.000174	000473	.000274	.000717	.000374	000981
00000			000430	000075	.000720		
.000075	.000232	.000175	.000478	.000275	.000720	.000375	.000965
.000075 .000076 .000077	.000232 .000236 .000240	.000175	.000478 .000480 .000484	.000276	.000720	.000375	.000965 .000968

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